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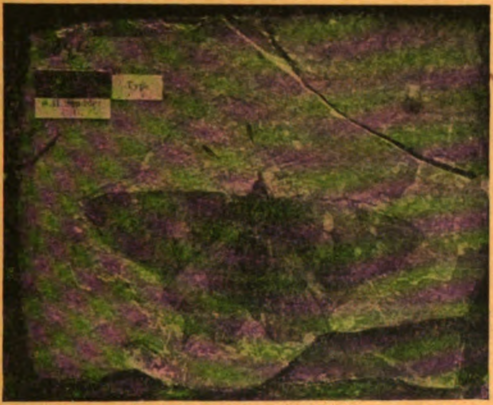

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THE IMMATURE STAGES OF *TROPIDOSTEPTES CARDINALIS* UHLER (CAPSIDAE, HEMIPTERA).[1]

By M. D. Leonard,
Ithaca, New York.

On June 10, 1908, Prof. C. R. Crosby first noticed that the leaves of an ash tree near the Cornell Insectary were being slightly injured by a Capsid which by that date had become adult. In the early spring of 1910 he prepared descriptions of the stages from nymphs reared on twigs forced out in the insectary, but no adults were obtained. In the spring of 1913 Professor Crosby called the writer's attention to the problem and the study of the immature stages of the insect was again taken up. The nymphs were redescribed and adults were obtained which were identified as *Tropidosteptes cardinalis* Uhler.

Detailed observations have not been made on the length of time required for the nymphs to complete their growth on the trees but on May 23, 1914, two first-stage nymphs were still present and, on June 4, the first fifth-stage nymph was observed. The insect spends the winter in the egg stage. The eggs are probably inserted during late summer into the smaller twigs but have not been definitely located. The following descriptions of the nymphal stages are based on notes made during the spring of 1914 and of 1915. The drawings were made by the writer with the exception of that of the fourth nymphal stage which was made by Miss Anna C. Stryke. The injury to the foliage consists of a yellow spotting or stippling which in more severe cases causes the leaves to crumple in places.

Stage I (Fig. 1): Length, .85 mm.; greatest width of abdomen, .45 mm. Ground color reddish; head strongly suffused with dusky; thorax with a large

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[1] Contribution from the Department of Entomology of Cornell University.

dusky spot on each segment, not reaching the lateral margin and interrupted by a median red line running the length of the thorax. This latter crosses, for a short distance, a procurved line of red on the vertex which extends almost to the cephalic border of the eyes. Abdomen red, sometimes mottled with red of a darker shade; opening of dorsal gland indicated by a small dusky spot. Eyes dark reddish; antennæ pale, suffused slightly with dusky, paler at the tip of the segments, whole of last segment reddish and slightly swollen. Legs pale, suffused slightly with dusky, tarsi slightly darker. Beak same as legs, extreme tip somewhat darker.

Stage II (Fig. 2): Length, 1.3 mm.; greatest width of abdomen, .7 mm. Ground color of head and thorax shining dark red, but strongly suffused with blackish, except the lateral margins, narrowly, of the thorax and a narrow median line which is as in preceding stage. Abdomen shining dark red, opening of dorsal gland indicated by a dusky spot. Eyes dark reddish; antennæ, beak and legs about the same as in preceding stage.

Stage III (Fig. 3): Length, 1.85 mm.; greatest width of abdomen, .975 mm. Head and thorax now wholly suffused with blackish except for a narrow reddish median line which terminates on the vertex in a procurved line extending towards either eye. Abdomen shining dark red, opening of dorsal gland indicated by a blackish spot. Eyes dark reddish, antennæ pale yellowish, slightly grayish distally, terminal segment wholly reddish. Legs pale yellowish washed with grayish, much as in preceding stages; tarsi slightly dusky. Wing-pads just becoming apparent on meso- and meta-thorax.

Stage IV (Fig. 4): Length, 2.2 mm.; greatest width, across wing-pads, 1.42 mm., giving body a very broad appearance. Head and thorax as in preceding stage. First three abdominal segments and a transverse spot on fourth segment on either side of the gland blackish. Rest of abdomen red. Eyes dark reddish. Antennæ as in preceding stage. Legs pale yellowish, terminal segment of tarsi suffused with dusky; hind femora with two rather faint dusky rings near the tip. Under side of insect dark red; basal segment and extreme tip of beak blackish, remainder slightly tinged with pinkish. Wing-pads extend back to third abdominal segment.

Stage V (Fig. 5): Length, 2.8 mm.; greatest width, across wing-pads, 1.8 mm. Head and thorax, including wing-pads, now shining black, except for the narrow, red, median line which meets a procurved line of the same color on the head, as in the preceding stages. Abdomen shining black, hind border of each segment broadly red. Eyes very dark reddish. First three segments of the antennæ, yellowish, suffused with dusky, especially at center of first segment and at tip and base of segments two and three; fourth segment red. Legs yellowish, the second segment of the tarsi, tip of tibiæ, a band on tibiæ, and two more or less distinct bands on femora, dusky. Wing-pads extend back almost to sixth abdominal segment.

Adult (Fig. 6)—*Female:* Length, about 5.5 mm.; greatest width, about 2.5 mm. Dark red with a broad black stripe extending from hind border of pronotum, but not including scutellum, to tip of wings. A small whitish spot on membrane where it meets tip of cuneus. Dorsum bare, finely punctate. Head shining, not punctate. Front of head with a black median stripe starting about even with antennal tubercles and running a short distance onto first segment of beak. Eyes black. Antennæ shining black, clothed with fine, short, golden hairs. Legs, except coxæ and trochanters, shining black; fore and middle femora with a brownish

yellow band near tip; base of tarsi slightly lighter; coxæ and trochanters yellowish or pinkish. Thorax beneath pinkish; venter reddish. First segment of beak brownish yellow, remainder blackish.

***Male,* about 5 mm. in length; similar to female.**

PROTHETELY IN THE ELATERID GENUS MELANOTUS.

By J. A. Hyslop,
Bureau of Entomology, Washington, D. C.

Two papers on the abnormal phenomenon termed prothetely appeared last year in Psyche. In one of these papers[1] six bibliographical references were given on the subject and in the other paper[2] a seventh was added to this list. Dr. Adam Böving brought another interesting paper on the same subject, published in 1914,[3] to my attention, and in looking over the literature two more papers were located.[4,5]

The present paper deals with a very striking case observed at the United States Entomological Laboratory in Hagerstown. The subject was *Melanotus communis* Gyll.

On May 18, 1915, Mr. J. J. Davis sent the writer fifty-eight living larvæ of *Melanotus communis* Gyll., collected near Cincinnati, Ohio, with the note that they were found damaging corn on river bottom land. These larvæ were shipped in salve boxes filled with moist Sphagnum moss, and when received were isolated in similar boxes partly filled with moist earth and fed seed corn. The boxes were all placed in galvanized iron trays and the contents examined, cast skins removed, soil moistened when necessary, and new food supplied, weekly.[6]

Strickland[7] suggested as an explanation of the phenomenon of prothetely that it "is usually caused by keeping the larvæ at an abnormally high temperature." The temperature to which this particular larva was subjected could not have varied to any appreciable extent from that of the fifty-seven other larvæ of the same series in the same trays. Up to the date of writing, September 23, 1915, three adults have emerged from this material, all of which appear to be perfectly normal, only seven of the larvæ have died and the remainder are moulting normally and feeding freely. In this same type of cage and in the same insectary, we have been carrying on experiments with about 2,000 Elaterid larvæ from all parts of the United States and the West Indies.

---

[1] Williams, F. X., 1914, Psyche, Vol. XXI, p. 126.

[2] Barber, H. S., 1914, Psyche, Vol. XXI, p. 190.

[3] Kemner, A., 1914, Ent. Tidsk. (Swedish), Vol. XXV, pt. 1–2, pp. 87–95.

[4] Tragardh, I., 1912, Fauna och Flora, pp. 245–255.

[5] Peyerimhoff, P. de, 1911, Bull. Soc. Ent. France, p. 327.

[6] The writer was ably assisted in this work by Messrs. H. L. Parker and W. E. Pennington of the Station staff.

[7] Strickland, E. H., 1911, Biol. Bull., Vol. 21, pp. 313–327.

However, this is the only instance of prothetely that we have ever observed. The soil with which these cages are filled is all taken from one potting bench. The amount and kind of food, I believe, can be eliminated as a factor in this particular instance as our larvæ are always supplied with an excess of food. The lids of the boxes, which we use as cages, fit with varying degrees of tightness and the rate of evaporation is, therefore, very inconstant in any given series of cages. On account of this, the cages are only watered when, in the judgment of the examiner, it is necessary. This introduces a large personal factor and could easily result in a cage becoming much more dry or moist than the other cages of the same series. As this seems to be the only variable, I am inclined

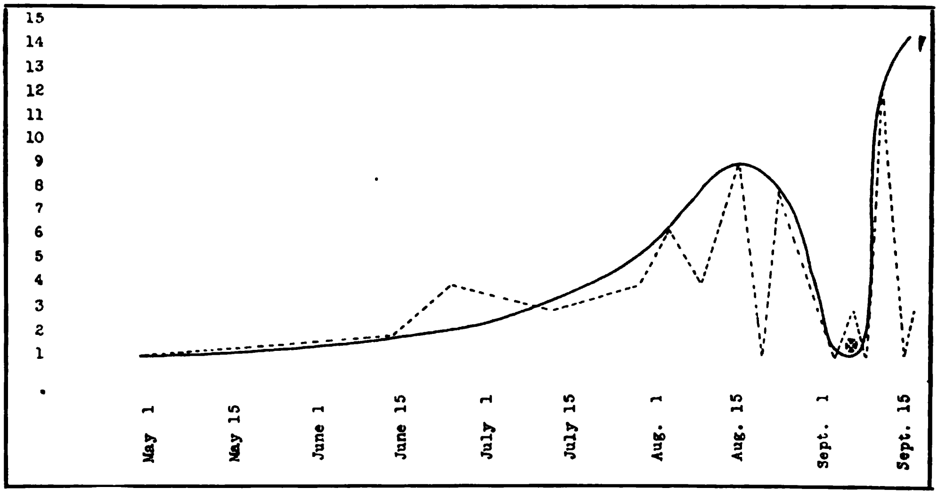

Fig. 1. Plotted curve of *Melanotus* molting periods. Cross indicates point at which prothetelous larva appeared. The dotted lines connect actual record points.

to believe that an abnormal humidity factor at or shortly before the time of pupation is the causative stimulus of this phenomenon.

The accompanying plotted curve (Fig. 1) indicates the period in the activity of the series, when the individual in question transformed to the abnormality herein described. The cages had all been examined on September 3. In examining the cages September 8, the prothetelous larva was discovered. This was a period of minimum moulting immediately preceding a very abrupt and extensive moulting period. The moulted skin of this larva was perfectly normal in every respect and, by careful comparative measurements, was found to be very nearly identical with the last larval skin; that is, the skin shed when a pupa is formed under normal conditions. The table (Fig. 2) shows the measurements of this cast skin as compared with a larval skin from the ultimate and penultimate instar.

	Penultimate Instar.	Ultimate Instar.	Larval Skin of Prothetelous Larva.
Length of dorsum of 9th abdominal segment . .	2.782	3.103	3.156
Width of dorsum of 9th abdominal segment. .	1.979	2.193	2.193
Length of dorsum of 1st thoracic segment. . .	1.498	1.819	1.712

Fig. 2. Table showing comparative measurements of larval skins of penultimate instar, ultimate instar and prothetelous larvæ.

This prothetelous larva is (Plate II, Figs. 3, 4, and 5) predominantly larviform. The abdomen is typically so and normally chitinized, with the exception of a pair of membranous papilliform areas on the posterior margin of each sternite except the ninth (Plate III, Fig. 3). The thoracic sterna are membranous except a triangular area on the prosternum (Plate III, Fig. 5), which is normally chitinized. The membranous areas are decidedly protuberant. The coxæ and trochanters are larviform with typical pupiform femora, tibiæ and tarsi. The ventral part of the protergite is membranous and very much expanded posteriorly. A pair of anterior and a pair of posterior papillæ are borne on the spiracular area of the protergum (Plate III, Fig. 5). The mouthparts are all larviform. The basal joint of the antennæ is larviform and chitinized; the remainder of the antennæ is membranous and typically pupiform. The eyes are typically pupiform with a membranous area surrounding them, which connects the eye with the larviform cheeks. The wing pads are well developed, but the elytral pads do not bear the normal striation found in typical pupa. The base of the wing pads is surrounded by a membranous area and the pads seem to arise in the spiracular area. The specimen measures 23 mm. in length, the dorsum of the ninth abdominal segment measures 2.996 mm. in length, and 2.14 mm. in width. The first thoracic tergite is 1.498 mm. long.

This particular case of prothetely seems to be a carrying forward of larval characters into the pupal stage rather than a carrying back of pupal characters into the larval stages. Such being the case, it is possible and even probable that by the successful emergence of such a pupa some larval characters would be carried into the adult stage, and if such characters were of some material advantage to their possessors natural selection might here find variations which could lead to the production of such species with larviform adults as do exist in certain other Coleopterous genera.

TWO NEW THYSANOPTERA FROM WEST AFRICA, WITH A NOTE ON THE SYNONYMY OF THE *PHLŒOTHRIPIDÆ*.

By J. Douglas Hood,
United States Biological Survey, Washington, D. C.

The new species described below were sent to me in October, 1915, from Ossidinge, Kamerun, by Lieut. A. W. Jobbins-Pomeroy, of the Nigeria Regiment, West African Frontier Force. Partly in recognition of his devotion to entomology under such adverse circumstances, and partly as a mark of personal regard, I have taken great pleasure in naming one of the species in his honor.

Suborder TUBULIFERA Haliday.

Family PHLŒOTHRIPIDÆ Uzel.[1]

1836. *Tubulifera* ("Stirps et Fam.") Haliday, Ent. Mag., Vol. III, p. 441.
1895. *Phlœothripidæ* Uzel, Monogr. Ordn. Thys., p. 223.
1896. *Tubuliferidæ* Beach, Proc. Iowa Acad. Sci., Vol. III, p. 214.
1912. *Ecacanthothripidæ* Bagnall, Ann. Mag. Nat. Hist., Ser. 8, Vol. X, p. 222.
1915. *Eupathithripidæ* Bagnall, Journ. Linn. Soc., Zool., Vol. XXXII, No. 220, p. 200.

In explanation of the above synonymy, it may be said that on the accompanying plate are given several detail drawings, which show the close similarity obtaining between *Phlœothrips*, *Acanthothrips*, and *Pselaphothrips*, and, consequently, the relationship of all with *Eupathithrips* and *Sedulothrips*. They are discussed below under the species headings.

Acanthothrips nodicornis Reuter, Fig. 7. (Drawn from a specimen ex collection O. M. Reuter, from Helsingfors, Finland.) It will be noted that the eyes of this species differ in no essential features from those of *Pselaphothrips* (Fig. 2); they are as finely and closely faceted, fully as prominent, very nearly as contiguous anteriorly and show almost as great a tendency to surround the ocelli; while on the ventral surface, it may be added, they are just as well separated.

Acanthothrips albivittatus Hood, Fig. 6. The antennæ of this species are very similar to those of *Pselaphothrips*, in color, form, and chætotaxy. With but few exceptions, every bristle and every sense cone finds its analogue in *Pselaphothrips* (Fig. 3). Furthermore, the antennæ are inserted more on the ventral than on the dorsal surface of the head; and the latter, while not crested dorsally, is nevertheless slightly elevated along the median line.

Acanthothrips magnafemoralis Hinds, Fig. 5. The third antennal segment is in this more slender than in the other species of the genus, and approaches the *Pselaphothrips-Eupathithrips-Sedulothrips* type very closely.

Phlœothrips coriaceus Haliday, Fig. 4. (Drawn from a specimen ex collection R. S. Bagnall, from Balsall Common, Warwickshire,

---

[1] The names Æolothripidæ, Thripidæ, and Phlœothripidæ were proposed by Uzel in 1895, and should be credited to him, instead of to Haliday. The latter proposed three family names—Coleoptrata, Stenoptera, and Tubulifera,—the last being employed also as a subordinal term. According to modern ideas, Haliday's names are invalid, because not formed from the oldest genus of the family by the addition of -idæ to the root.

England.) Here, again, the same general type of chætotaxy prevails, the number and arrangement of sense cones and bristles being almost identical.

This disposes of all the characters used in the separation from the Phlœothripidæ of the genera allied to *Eupathithrips*, with the exception of that of the long mouth cone. This character, however, frequently varies in closely allied species of the same genus; and in the genera grouping themselves about *Liothrips*, the mouth cone is sometimes as elongate as here.

These are, in detail, the reasons for the sinking of Bagnall's recently diagnosed family Eupathithripidæ as a synonym of the Phlœothripidæ. It will be seen that the twelve or thirteen differences given by him for the separation of this group are broken down in a most interesting manner by the new genus described below as *Pselaphothrips*, which is in nearly all respects intermediate between *Eupathithrips* Bagnall and *Acanthothrips* Uzel[1]; and the last genus is very closely allied indeed to *Phlœothrips* Haliday, the type of its family. *Eupathithrips* and its allies, then, for the present, at least, are best considered part of a moderately large complex represented by *Phlœothrips*, *Ecacanthothrips* and *Sedulothrips*. The last two are the extremes of two different lines of specialization; and to separate either from the parent stem with the rank of family would, I believe, be a step backward, and one away from our ideal of a true phylogenetic classification.

Genus **Podothrips** Hood.

1913. *Podothrips* Hood, Ins. Insc. Menstr., Vol. I, p. 67.

Body depressed, glabrous. Head longer than wide, much narrowed toward base, widest behind eyes, about equal in length to prothorax, evenly declivous in front; cheeks nearly smooth, without spiniferous tubercles. Ocelli placed far forward, the median one between basal segments of antennæ; posterior ocelli widely separated. Antennæ eight-segmented, the last two segments not compactly united. Mouth cone blunt, much shorter than its width at base. Prothorax about as long as head, about twice as wide at base as at apex, lobed behind, with median dorsal thickening, lateral outline concave, only the two pairs of bristles at posterior angles well developed. Legs of moderate length, stout; fore femur nearly as long and broad as head; fore tibia with a stout tooth at tip in both sexes; fore tarsus armed with a long hooked tooth. Wings slender, narrowed at middle; fringe sparse and weak, on fore wing not double along posterior margin near apex.

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[1] Karny's *Acanthothrips grandis* described from Argentina (Zoöl. Ann., Vol. IV, p. 324, 1912), is almost certainly a *Eupathithrips*, though a more extensive description or an examination of the type specimen will be necessary before this point can be determined. There is nothing in the description to exclude the species from *Eupathithrips silvestrii* (Buffa).

Type: Podothrips semiflavus Hood.

The new African species described below has made necessary two or three slight changes in the original description of the genus. The two known species are strictly congeneric, though differing abruptly in color and certain details of structure.

KEY TO SPECIES.

a. Yellow, with head, sides of metathorax, and last three abdominal segments abruptly dark brown; cheeks rounded behind eyes, not toothed *Podothrips semiflavus* Hood.

aa. Dark blackish brown, with antennal segments 3–7, the fore tibiæ, all tarsi, and first abdominal segment yellow; cheeks with a distinct, lateral, acute tooth behind eyes........................*Podothrips denticeps* Hood.

Podothrips denticeps sp. nov.

Female: Length about 1.8 mm. Surface shining. Color dark blackish brown, with antennal segments 3–7, fore tibiæ, all tarsi, and first abdominal segment, pale lemon yellow; wings pale yellowish, darker toward base.

Head 1.35 times as long as wide, with a distinct, lateral, acute, and more or less forwardly directed tooth just behind eye, thence arcuately converging to near base, where there is a slight neck-like constriction; vertex rounded and evenly declivous; dorsal surface without sculpture; cheeks very slightly roughened, sparsely and briefly spinose; postocular bristles slightly knobbed, two-thirds as long as eyes, situated close to lateral margins of head. Eyes one-third as long as head and three-fourths as wide as their interval, not protruding, ventral extent very slightly less than dorsal. Ocelli anterior in position, the posterior pair near the anterior angle of eyes, the median ocellus between basal segments of antennæ. Antennæ nearly 1.5 times as long as head, moderately slender; segment 1 slightly broader at base than ventral length; 2 narrower than 1, nearly twice as long as wide; 3 elongate-oval, pedicellate, with a slight notch on inner surface at basal third, nearly twice as long as wide; 4–6 elongate-oval, subequal in length and successively decreasing in width, briefly pedicellate, 4 slightly broader than 2 and 3; 7 slender, very slightly longer than 6, about 2.4 times as long as wide; 8 fusiform-truncate, very slender and nearly 0.9 as long as 7, about four times as long as greatest width; sense cones and bristles unusually short and weak; segments 1, 2, and 8 nearly concolorous with head, 2 yellow in outer apical half; intermediate segments clear lemon yellow, except 7, which is lightly washed with brown.

Prothorax about five-sixths as long as head and (inclusive of coxæ) twice as wide at base as at apex and 0.7 as long as wide; lateral outline concave; surface smooth; median dorsal line distinctly chitinized; all usual bristles present, the anterior marginal pair visible only under highest magnifications; the anterior angular and mid-lateral pairs only slightly larger; the two pairs near the posterior angles and the coxal pair knobbed, nearly as long as postoculars. Pterothorax about as wide as base of prothorax, sides nearly straight and parallel. Legs moderately stout; fore femur nearly as long as head and about twice as long as greatest width; fore tibia stout, scarcely as long as width of femur, with a stout, prominent tooth on inner side of apex, just basal to which is a setose tubercle; fore tarsus with a long, strong, hooked tooth about two-thirds its length, the inner surface of tooth with a setose tubercle at apical two-fifths. Wings long, slender, weak, slightly suffused with yellowish (particularly toward base), without double subapical fringe.

Abdomen slender, slightly wider than pterothorax. Tube nearly 0.6 as long as head, basal fourth slightly swollen, nearly 2.5 times as wide as apex; terminal bristles brown, about 1.5 times as long as tube; all other abdominal bristles pale, in great part knobbed.

Measurements of holotype (female): Length 1.81 mm.; head, length 0.252 mm., width 0.186 mm.; prothorax, length 0.205 mm., width (inclusive of coxæ) 0.300 mm.; pterothorax, width 0.288 mm.; abdomen, width 0.307 mm.; tube, length 0.144 mm., width at base 0.074 mm., at apex 0.030 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)..............	39	52	51	48	46	47	48	42
Width (μ)..............	40	28	28	29	27	25	20	11

Total length, 0.373 mm.

Described from a unique female collected by Lieut. A. W. Jobbins-Pomeroy, on grass, near Ossidinge, Kamerun, in October, 1915.

Genus **Pselaphothrips** nov.

(ψηλαφσω, to feel[1]; Θριψ, a wood worm.)

Body not depressed. Head much less than twice as long as wide, and more than twice as long as prothorax, compressed and subcarinate above; cheeks nearly parallel, not at all swollen toward base, and with a few small spiniferous tubercles; vertex sulcate and nearly overhanging in front of anterior ocellus. Eyes moderate in size, finely and closely faceted, scarcely prominent or protruding, well separated anteriorly, slightly reniform, exhibiting little tendency to surround the ocelli. Ocelli anterior, not set on an elevation, the median one directed nearly forward, the posterior pair approximate. Antennæ eight-segmented, nearly twice as long as head, scarcely "set on ventral surface of head," moderately slender, intermediate segments stout (that is, for the group; in the genotype scarcely three times as long as wide), clavate, distally abruptly narrowed; sense cones long and slender. Mouth cone very long and slender, attaining base of mesosternum. Prothorax broadly arcuate (scarcely emarginate) in front, its median dorsal length more than one-third the width across coxæ. Legs moderately slender; fore femora not swollen, with an acute tooth on inner surface near apex; fore tarsi armed. Wings slender, of equal width throughout; fore pair with a subbasal dark band and many accessory hairs on posterior margin.

Type: Pselaphothrips pomeroyi sp. nov.

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[1] In reference to the apparently very sensitive antennæ,—although the function of the conidia is presumably olfactory instead of tactile.

This genus is closely allied to *Acanthothrips*, *Eupathithrips*, and *Sedulothrips*, but differs from the last two in a number of characters which Bagnall considers of family importance. From *Acanthothrips* it may be separated by the long mouth cone and the compressed and subcarinate dorsum of the head. It is the only member of the *Eupathithrips* group occurring outside the Neotropical region.

Pselaphothrips pomeroyi sp. nov.

Female: Length about 3 mm. Color dark blackish brown, with purple hypodermal pigmentation in head, thorax, and abdomen; antennæ and legs concolorous with body; tube paler in apical half.

Head 1.44 times as long as wide, compressed and subcarinate above; cheeks nearly parallel, not at all swollen toward base, anteriorly roundly converging to eyes, set with a few small spiniferous tubercles; vertex sulcate and nearly overhanging in front of anterior ocellus; postocular bristles short, scarcely one-fourth as long as eyes, dilated at tip. Eyes very finely and closely faceted, not at all protruding, nearly 0.4 as long as head, well separated anteriorly, slightly reniform, showing little tendency to surround the ocelli. Ocelli anterior, not set on an elevation, the median one directed nearly forward and distinctly removed from the approximate posterior pair. Antennæ about 1.9 times as long as head, moderately slender, uniform dark blackish brown in color; segments 3–6 clavate, abruptly narrowed apically, urn-or vase-shaped, 3–5 about 2.7 and 6 about 2.4, times as long as wide; 7 fusiform-truncate, closely united to 8, which is conical; 4 slightly longer than 3; sense cones long, slender, broad at base, those on segment 3 more than half the length of segment; formula: 3, 1–2; 4, $2\text{–}2^{+1}$; 5, $1\text{–}1^{+1}$; 6, $1\text{–}1^{+1}$; 7 with one on dorsum near apex. Mouth cone and palpi very long, the former acute and attaining metasternum.

Prothorax broadly arcuate (scarcely emarginate) in front, its median dorsal length about 0.43 of that of head and 0.37 of the width across coxæ; pronotum nearly smooth, with faint anastomozing lines in posterior third and at sides, and with rather conspicuous short pubescence; median line slightly chitinized; all usual bristles present, and with an additional accessory pair arising mediad and cephalad to the base of the outer posterior pair, all short, dilated at tip, equal to or longer than postoculars, the outer pair at posterior angles longest. Pterothorax about equal in width to prothorax, sides nearly straight, slightly converging posteriorly. Wings long, closely fringed, fore pair with about 35 accessory hairs on posterior margin, and of equal width throughout; fore wings with the scale dark brown and in costal half reticulated similarly to the mesonotum; a dark brown, stippled, granulate, cross band occupies the second sixth, and a lighter brown cloud the apical two-fifths of fore wing, these connected and at least partially traversed by the dark median vein, and in addition connected along both margins of wing by a brown line; third basal spine of fore wing, dark brown, long, slender, and slightly knobbed at tip, set in a small, isolated, stippled, brown spot; first and second basal spines pale, short, stout, and rather strongly dilated at tip, surrounded by an obscurely darkened and sparsely stippled area. Legs moderately slender; fore femora not swollen, with an acute tooth on inner surface near apex, and with numerous minute spines, stouter on inner surface; fore tibiæ with slenderer spines; fore tarsi with a blunt tooth on inner surface.

Abdomen slender, about equal in width to the pterothorax. Tube about three-fourths as long as head and a little less than half as wide at apex as at base, paler in apical half. Marginal abdominal bristles (excepting those on segment 9, which are pointed and about equal in length to tube) moderately short, blunt, yellowish; terminal bristles slightly longer than tube, brown, pointed.

Measurements of holotype: Length 2.93 mm.; head, length 0.468 mm., width 0.324 mm.; prothorax, length (along median dorsal line) 0.204 mm., width (inclusive of coxæ) 0.558 mm.; pterothorax, width 0.552 mm.; abdomen, width 0.552 mm.; tube, length 0.348 mm., width at base 0.122 mm., at apex, 0.066 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	78	87	165	174	154	94	78	47
Width (μ)	49	41	60	63	57	39	33	18

Total length, 0.877 mm.

Described from one female taken in flight, by Lieut. A. W. Jobbins-Pomeroy, at Ossidinge, Kamerun, in October, 1915.

EXPLANATION OF PLATE IV.

(Minute pubescence not shown.)

Fig. 1. *Podothrips denticeps* sp. nov., head and prothorax, female, holotype.

Fig. 2. *Pselaphothrips pomeroyi* gen. et sp. nov., head and prothorax, female, holotype.

Fig. 3. *Pselaphothrips pomeroyi*, segments 3 and 4 of right antenna, female, holotype.

Fig. 4. *Phlœothrips coriaceus* Haliday, segments 3 and 4 of right antenna, female.

Fig. 5. *Acanthothrips albivittatus* Hood, segment 3 of right antenna, female.

Fig. 6. *Acanthothrips magnafemoralis* Hinds, segment 3 of right antenna, female.

Fig. 7. *Acanthothrips nodicornis* Reuter, head, female.

A PRELIMINARY LIST OF THE ODONATA OF CONCORD, MASS.

By R. Heber Howe, Jr.,
Concord, Mass.

Two years ago I interested one of my students in making a collection of the local dragon flies of Concord for the Thoreau Museum of Natural History of the Middlesex School. This student, Mr. E. L. Peirson, Jr., collected on occasional afternoons from April until early June, and his material was determined through the kindness of Dr. P. P. Calvert. Mr. Peirson published in the Proceeding of this Museum (Vol. I, p. 41, 1915) a list of twelve species, a few of which had been collected preceding his work and which had been determined by Mr. C. W. Johnson. Mr. Peirson published this list largely because he had secured the second capture of *Williamsonia lintneri* in New England (see also Ent. News, 26, p. 238, 1915), a species never before recorded from these states.

During the past summer, because of continued residence in Concord, I have had the opportunity to collect almost daily, and have visited practically all the ponds and the river valleys, with the result that I am now able to publish a considerable list of species. No doubt further collecting in April and May will add many species in the Gomphinæ. Throughout the summer I had the help of my daughter, Miss Susan A. Howe, and in my determinations I have had the continual aid of Mr. Edward B. Williamson, and also occasionally that of Mr. Richard A. Muttkowski and Dr. E. M. Walker. To these gentlemen I extend my sincere thanks.

In the present list I have made my comparisons of distribution with Dr. Calvert's List of the *Odonata* of New England (Occas. Papers Bost. Soc. Nat. Hist., 7, 1915).

ZYGOPTERA.

AGRIONIDÆ.

CALOPTERYGINÆ.

1. *Calopteryx æquabilis* Say. Collected by Peirson. ♂. May.
2. *C. maculata* (Beauvois) Burm. Common. ♂ and ♀s. May to August 19.

LESTINÆ.

3. *Lestes eurinus* Say. Common. ♂ and ♀s. July.
4. *L. congener* Hagen. Not uncommon. ♂ and ♀s. September 5 to 30. New to Massachusetts.
5. *L. disjunctus* Selys. Three specimens. ♂. September 5 to 18. New to Massachusetts.
6. *L. unguiculatus* Hagen. Very common. ♂ and ♀s. August 15 to September 5. New to Middlesex County.
7. *L. forcipatus* Rambur. Rather uncommon. ♂s. August 31 to September 5.
8. *L. vigilax* Hagen. Rather uncommon. ♂ and ♀s. August 15 to September 5. New to Middlesex County.
9. *L. rectangularis* Say. Uncommon. ♂ and ♀s. August 23 to September 15.

AGRIONINÆ.

10. *Argia violacea* (Hagen) Selys. Common. ♂ and ♀s. May to September 10. New to Middlesex County.
11. *Enallagma laterale* Morse. Rare. ♂s. May to July. Recorded also by Pierson.
12. *E. calverti* Morse. Recorded by Peirson.
13. *E. ebrium* (Hagen) Selys. Common. ♂ and ♀s. August 1 to 15. New to Middlesex County.
14. *E. civile* (Hagen) Selys. Common. ♂ and ♀s. May to September 5.
15. (?) *E. minusculum* Morse. One specimen. ♂.
16. *E. aspersum* (Hagen) Selys. One specimen. ♂. August to September 5.
17. *E. traviatum* Selys. Rather rare. ♂s. August 1.
18. *E. geminatum* Kellicott. A few specimens. ♂ and ♀s. August 1 to September 10. New to Massachusetts.
19. *E. signatum* (Hagen) Selys. Common. ♂s. July to September 5. New to Middlesex County.
20. *E. pollutum* (Hagen) Selys. A few specimens. ♂. August 4. This species has never been recorded south of Maine, and is, therefore, new to Massachusetts.
21. *Ischnura verticalis* (Say) Selys. Uncommon. ♂ and ♀s. August 23 to September 5.

ANISOPTERA.

ÆSHNIDÆ.

GOMPHINÆ.

22. *Gomphus exilis* Selys. Recorded by Peirson. ♀.
23. *G. borealis* Needham. One specimen. ♀. May 1915. New to Massachusetts.
24. *G. spiniceps* (Walsh) Selys. Recorded by Peirson.
25. *G. spicatus* Hagen. Common. ♂ and ♀s. May.
26. *Dromogomphus spinosus* Selys. Rather common. ♂s. July. New to Middlesex County.
27. *Anax junius* (Drury) Selys. Common. ♂ and ♀s. August to September 19.
28. *Æschna clepsydra* Say. Two specimens. ♂. September 10 to September 30.
29. *Æshna constricta* Say. Common. ♂ and ♀s. August to September. New to Middlesex County.
30. *A. umbrosa* Walker. Four specimens. ♀. May to October 17. New to New England.
31. *A. canadensis* Walker. One specimen. ♂. September 5. New to New England.
32. *Epiæschna heros* (Fabricius) Hagen. Recorded by Peirson. ♀. May. New to Middlesex County.
33. *Basiæschna janata* (Say) Selys. Not uncommon. ♂ and ♀s. May. Recorded also by Peirson.
34. *Gomphæschna furcillata* (Say) Selys. Recorded by Peirson. ♀. May. New to Middlesex County.

LIBELLULIDÆ.

CORDULINÆ.

35. *Didymops transversa* (Say) Hagen. Common. ♂s. May.
36. *Tetragoneuria cynosura* (Say) Selys. Recorded by Peirson. May.
37. *Williamsonia linteri* Hagen = *Cordulia linteri* Hagen Recorded by Peirson. May. New to New England.

LIBELLULINÆ.

38. *Libellula cyanea* Fabricius. Rather rare. ♂ and ♀s. August.
39. *L. incesta* Hagen. Abundant. ♂ and ♀s. July to September 10.
40. *L. exusta* Say. Rare. ♀. May to July. Recorded by Peirson.
41. *L. luctuosa* Burm. Common. ♂ and ♀s. July to August 15. New to New England.
42. *L. pulchella* Drury. Common. ♂s. August 18 to September 8.
43. *Plathemis lydia* (Drury) Hagen. Common. ♂s. July to September 3.
44. *Sympetrum rubicundulum* (Say) Kirby. Abundant. ♂ and ♀s. August 7 to September 30.
45. *S. semicinctum* (Say) Kirby. Rare. ♂ and ♀s. August 25 to September 18. New to Middlesex County.
46. *S. vicinum* (Hagen) Kirby. Common. ♂ and ♀s. August 15 to November 7.
47. *S. costiferum* (Hagen) Kirby. Rare. ♂ and ♀s. September 5 to 18. New to Middlesex County.
48. *Celithemis elisa* (Hagen) Walsh. Recorded from Concord in Dr. Calvert's New England list.
49. *C. eponina* (Drury) Hagen. Common. ♂s. July to August.
50. *Perithemis domitia tenera* (Say). Very common. ♂ and ♀s. July to August 3.
51. *Erythemis simplicicollis* (Say). Not uncommon. ♂ and ♀s. July to August 23.
52. *Pachydiplax longipennis* (Burm.) Brauer. One specimen. ♂. August.

SUMMARY.

Number of species formerly known from New England	140
Number added	4
Number of species formerly known from Massachusetts	101
Number added	9
Number of species formerly known from Middlesex County	44
Number added	20
Number now known from Middlesex County	64
Number here listed	52

ELATERIDÆ AND THROSCIDÆ OF THE STANFORD UNIVERSITY EXPEDITION OF 1911 TO BRAZIL.

By J. A. Hyslop,
Bureau of Entomology, Washington, D. C.

Through the kindness of Dr. W. M. Mann, of the Bussey Institution, Harvard University, I have been accorded the great pleasure of examining the *Elateridæ* and the single Throscid collected on the Stanford expedition of 1911 to Brazil.

The collection is small and, contrary to most tropical collections, contains excellent series of several species. It contains three new species, two in the genus *Monocrepidius* and one which I tentatively place in the genus *Drasterius*. The types of these species have been deposited in the Museum of Comparative Zoölogy at Harvard University. The Madeira River collections are remarkably interesting as the fauna of this region is bound to throw light on the relationship between the Andean and Amazonian basin faunæ, and thus to the relationship between the South and Central American faunas. Following is a list of the specimens collected. The *Elateridæ* were all collected by W. M. Mann, Fred Baker and Harold Heath.

THROSCIDÆ.

Drapetes plagiatus (Boh.) Gerst.
Abuná, Rio Madeira, Brazil. (Mann & Baker)..............1 specimen

Previously recorded from several parts of Central and South America, and Boheman has recorded the species from San Francisco, Cal.

ELATERIDÆ.

Chalcolepidius candezei Dohrn.
forma typica
Abuná, Rio Madeira, Brazil (Mann & Baker)...............2 ♀ specimens
Madeira-Momoré R. R. Co. Camp 39.....................2 ♀ specimens
var. a. elytra as in *forma typica*, vestiture of pronotum and ventron green.
Porto Velho, Rio Madeira, Brazil (Mann & Baker).........1 ♀ specimen
var. b. vestiture of elytral striæ ferruginous yellow, pronotum and ventral vestiture green.
Madeira-Mamoré R. R. Co. Camp 39, Rio Madeira, Brazil (Mann & Baker) 7 ♀ specimens

Madeira-Mamoré R. R. Co. Camp 35, Rio Madeira, Brazil (Mann & Baker) 1 ♀ specimen

Madeira-Mamoré R. R. Co. Camp 41, Rio Madeira, Brazil (Mann & Baker) 2 ♀ specimens

Madeira-Mamoré R. R. Co. Camp 43, Rio Madeira, Brazil (Mann & Baker) 1 ♀ specimen

Chalcolepidius limbatus Esch.

Maranguape Mountains, Ceará, Brazil (W. M. Mann)....1 ♂, 1 ♀ specimen

Independência, Parahyba, Brazil (Mann & Heath)..........1 ♀ specimen

Semiotus furcatus (F.) Lap. var.

Abuná, Rio Madeira, Brazil (Mann & Baker)..............1 specimen

Semiotus ligneus (Linn.) Westwood.

Madeira-Mamoré R. R. Co. Camp 39, Rio Madeira, Brazil (Mann & Baker) 1 specimen

Semiotus suturalis (F.) Lap.

Rio Madeira, Brazil (Mann & Baker)......................1 specimen

Ischiodontus nigrita Cand.

Pará, Brazil (W. M. Mann)...............................1 specimen

Ischiodontus ichthydius Cand.

Manaos, Brazil (Mann & Baker)...........................1 specimen

Previously only recorded from Central America and Mexico.

Ischiodontus subsericeus Cand.

Pará, Brazil (W. M. Mann)...............................1 specimen

Pyrophorus noctilucus (Linn.) Esch.

Madeira-Mamoré R. R. Co. Camp 39, Rio Madeira, Brazil (Mann & Baker) 1 ♂, 1 ♀ specimen

Common in all parts of intertropical America.

Pyrophorus amplicollis Cand.

Madeira-Mamoré R. R. Co. Camp 39, Rio Madeira, Brazil (Mann & Baker) 1 ♀ specimen

Cardiorhinus bilineatus (Fab.) Germ.

Pará, Brazil (W. M. Mann)...............................1 specimen

Cardiorhinus cuneatus Cand.

Manaos, Brazil (Mann & Baker)...........................1 specimen

Cardiorhinus castanipennis Germ.

Manaos, Brazil (Mann & Baker)...........................1 specimen

Trichophorus crassus (Cand.) Schw.

Abuná, Rio Madeira, Brazil (Mann & Baker)...............1 specimen

Horistonotus elegans (Sol.) Cand.

Natal Brazil (W. M. Mann)...............................2 specimen

Monocrepidius brunnipennis Cand.

Independência, Parahyba, Brazil (Mann & Baker).............1 specimen

Monocrepidius stigmosus Germ.

Independência, Parahyba, Brazil (Mann & Heath).............1 specimen

Monocrepidius madierensis sp. nov.

Rio Madeira, Brazil (Mann & Baker)......................1 specimen

Monocrepidius bakeri sp. n.
Rio Madeira, Brazil (Mann & Baker)........................1 specimen
Aeolus testudineus Champ.
Itacoatiara, Amazonas, Brazil (Mann & Baker)................1 specimen
The only other locality known is that of the two cotypes;
Paso Antonio, Guatemala, (Champ.).
Aeolus biplagiatus Cand.
Independéncia, Parahyba, Brazil (Mann & Heath)...........8 specimens
Ceará-mirim, Rio Grande do Norte, Brazil (W. M. Mann)......1 specimen
Heteroderes laurentii (Guer.) Cand.
Porto Velho, Rio Madeira, Brazil (Mann & Baker)..........52 specimens
Rio Madeira, Brazil (Mann & Baker)........................3 specimens
Itacoatiara, Amazonas, Brazil (Mann & Baker)................1 specimen
Pará, Brazil (W. M. Mann)...................................1 specimen
Drasterius manni sp. n.
Independéncia, Parahyba, Brazil (Mann & Heath)...........4 specimens

The single specimen of *Semiotus furcatus* (Fab.) Lap. (Fig. 1, b) is a remarkable variety, as it is undoubtedly the intermediate between typical *furcatus* (Fig. 1, a) which inhabits eastern Amazonas, Venezuela, Guiana, etc., and *S. bilineatus* Cand. (Fig. 1, c) which is indigenous to Colombia. *S. fulvicollis* Blanch. (Fig. 1, d) is but a variety of *furcatus*, separated on the furcation of the marginal black vitta being carried to the tip of the elytron, thereby making a submarginal vitta. In typical *furcatus* the marginal vitta is furcate to beyond the middle and the thoracic vitta is narrowly fusiform. In *S. bilineatus* the vitta is completely fused and the thoracic vitta is oval, and covers more than one third of the notum. The specimen in this collection and another similar specimen in my collection, taken at Pebas, Peru, the lateral marginal vittæ are similar to those of *furcatus* but the dorsal vittæ are similar to *S. bilineatus*.

The series of specimens of *Chalcolepidius candezei* Dohrn. include two very distinct varieties and one intermediate. The typical form collected at Abuná and Camp 39 has the strial vittæ thickly beset with whitish colored scales, and the prothorax and ventral surfaces with bronze purple scales.

Var. b. collected at R. R. Camps 35, 39, 41, and 43 has the elytral interstrial spaces clothed with metallic green scales and striæ beset with deep ferruginous scales, the thorax and ventron clothed with metallic green scales. Var. a. collected at Porto Velho is intermediate between the other two. It has elytra like the *forma typica* and the rest of the vestiture similar to var. b.

Ischiodontus ichthydius Cand. is quite common in Mexico and Central America, but this is the first record I have seen of the collection of the species in continental South America. The collecting of *Aeolus testudineus* Champ. from Amazonas is remarkably interesting, inasmuch as this species is unknown in literature, except for the two cotypes mentioned by Champion[1] from Guatemala.

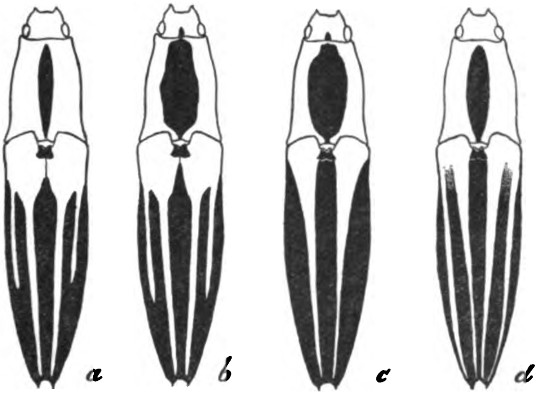

Fig. 1. Species of *Semiotus;* a. *S. furcatus;* b. *S. furcatus,* var.; c. *S. bilineatus;* d, *S. fulvicollis.*

Horistonotus elegans (Sol.) Cand. is recorded only from Chilki by Candèze.

Drasterius manni sp. nov. (Pl. V, Fig. 1a).

Piceous black, moderately densely greyish pilose, pile long. Anterior part of front, anterior angles of the prothorax, anterior angles and tip of elytra, obscurely reddish brown, under parts castaneous, legs dusky yellow, antennæ yellowish ferruginous. Front strongly umbilicate punctate, pronotum densely on sides and sparsely on disc umbilicate punctate (Pl. V, Fig. 1b). Posterior angles very short and almost rectangular, not carinate. Deep incision on posterio margin of pronotum near posterior angles. Propluræ moderately densely umbilicate-punctate, punctures elongate near the sutures (Pl. V, Fig. 1d) becoming round as they approach the side margins. Prosternum with but few scattered simple punctures almost without punctuation. Scutellum pentagonal. Posterior coxal plates (Pl. V, Fig. 1c) very abruptly widened near middle but without median tooth, outwardly incomplete. Elytra punctate striate, strial punctures elongate and about as distantly placed as the interstitial spaces. Interstices almost flat, not punctate, feebly rugose. Joints of tarsi (Pl. V, Fig. 1e) gradually decreasing in length from first to fourth. Ungues with basal angles strongly produced (Pl. V, Fig. 1f) Antennal joints two and three sub-equal, sylindrical, three almost as long as four. Joints four to ten elongate triangular, joint eleven suboval not strongly constricted.

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[1] Biol. Centr. America, Vol. III, Coleop., p. 362, 1895.

Length, 3 to 4 mm.

Type locality: Independéncia, Parahyba, Brazil.

Type: No. 9048 deposited in Mus. Comp. Zoöl., Harvard University.

Paratypes: Three specimens from type locality.

Type and paratypes collected by Messrs. W. W. Mann and Harold Heath.

This species, which is named in honor of Dr. W. M. Mann, will fall near *Drasterius pullatus* Cand. in Candèze's Monograph.

Monocrepidius madeirensis sp. nov. (Pl. V, Fig. 2a).

Moderately elongate, depressed, length four and two-third times width, moderately dense and finely yellow pubescent. General color reddish yellow or amber. Head concolorous with body, marked by two parenthesis-shaped infuscate vittæ on vertex, eyes dark brown; pronotum with a pair of parenthesis-shaped dark brown vitta which attain the anterior margin. Elytra slightly darker than the prothorax with two brown transverse bands, one before the middle and the other halfway between this band and the apex, and a median longitudinal vitta which extends from the scutellum to the anterior transverse band. Scutellum and humeral angles yellow. Ventron brownish yellow. Legs and antennæ yellow. Front slightly convex, finely punctate, anterior margin feebly rounded, terminal joint of maxilliary palpi securiform. Antennal joints two and three small, together not quite equal to four, joint three longer than two (Pl. V, Fig. 2b). Prothorax longer than broad, sides feebly rounded, convergent anteriorly from middle, quite depressed, pronotum with slightly unequal punctuation; posterior angles very slightly divergent, unicarinate, carina almost fused with lateral margin to base of posterior angles where they diverge, carina not much longer than angles. Elytra two and one-fourth times length of prothorax, almost as wide as latter, punctate striate, interstices slightly convex, not spinose at tips. Fourth tarsal joint (Pl. V, Fig. 2c) bearing a large broad lobe easily seen from above.

Length, 7 mm.

Type locality: Rio Madeira, Brazil.

Type: No. 9047 Mus. Comp. Zoöl. Harvard University.

Type collected by W. M. Mann and F. Baker.

This species is named from the type locality and is near *depressipennis* Cand.

Monocrepidius bakeri sp. nov. (Pl. V, 3a).

Elongate, slender, three and one-half times as long as broad, moderately convex, vestiture yellow, dense and very fine. General color infuscate amber; head black, labrum black, antennæ amber, under parts of head and palpi yellow; pronotum amber with four black fascia on disc and another pair near middle of sides almost attaining the lateral margins, the anterior discal fascia do not attain the anterior margin and are bluntly oval, the posterior pair are convergent posteriorly and are produced to attain the posterior margin. Elytra amber colored with black areas disposed as follows: humeral angles and scutellum and its cavity forming an irregular transverse band across the base; elongate area on each side margin near middle with a sinuate band connecting them with the median vitta which extends backward from the scutellum; posterior third except for two lateral rounded spots. Prosternum and flanks amber, prosternal sutures black, remainder of ventron dark brown, legs except coxæ yellow. Front convex, anterior margin broadly rounded, moderately punctate. Antennæ with joints two and three subequal, together equal to four. Pronotum not tuberculate at base, moderately evenly sparsely punctate; posterior angles unicarinate, carina distinct to apex of posterior angles where it joins the lateral margin. Elytra not spinose at tip. Prosternum finely punctate, flanks coarsely punctate. Last abdominal segment similar in punctuation to preceding segments. Tarsal joint four (Pl. V, Fig. 3b) with a moderately long slender lobe, not visible from above.

Length, 5 mm.

Type locality: Rio Madeira, Brazil.

Type: No. 9046 Mus. Comp. Zoöl. Harvard University.

Type collected by W. M. Mann and F. Baker.

This species which I have named in honor of Dr. Baker is near *Monocrepidius pictus* Cand. but is easily distinguished from this species by the absence of the basal pronotal tubercle.

EXPLANATION OF PLATE V.

Fig. 1. *Drasterius manni;* a. dorsum of adult; b. pronotal sculpturing; c. posterior coxal plate; d. propleural sculpturing; e. tarsus; f. tarsal claws.

Fig. 2. *Monocrepidius madeirensis;* a. dorsum of adult; b. second, third, and fourth antennal joints; c. third, fourth, and fifth tarsal joints.

Fig. 3. *Monocrepidius bakerei;* a. dorsum of adult; b. tarsus.

A PSYLLID GALL ON JUNCUS (*LIVIA MACULIPENNIS* FITCH).[1]

By Edith M. Patch.

Since 1857 when Fitch described this beautiful little insect, nothing more definite in regard to its habits has been recorded than that it is found in swampy places. Thomas in 1879 said that it was "found on the sweet-flag," but there is nothing in his account which would indicate that it fed upon that plant.

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[1] Papers from the Maine Agricultural Experiment Station: Entomology, No. 82.

This past summer, however, the secret of its habitation was discovered by Miss Cora H. Clarke of Boston, who made an interesting collection of Juncus galls near Magnolia Village, Mass., on August 17, which she shared with the writer. At this date the galls contained only unknown nymphs of a Psyllid but they were about ready to wing and the adults began to emerge in large numbers on August 20–21. These proved to be *Livia maculipennis* Fitch.

The accompanying photograph gives the enlarged abnormal growth of the galled-specimen in contrast to the normal rush, and makes a description unnecessary.

Did Fitch, nearly sixty years ago, pick a stem of rush with its monstrous tassel deserted by its colony and wonder "What did that?" while the little "spotted wings" were flitting about the marsh or resting perchance upon sweet-flag near by?

THE COCCIDÆ OF NEW JERSEY GREENHOUSES.

By Harry B. Weiss,
New Brunswick, New Jersey.

While greenhouse coccids are not strictly a part of the New Jersey fauna, yet many of them are more or less permanently established and are a constant source of annoyance and expense to various growers. Except for the "mealy bugs" and a few species of "soft" and "armored scales," many of them are difficult to control and most of the insecticides recommended for greenhouse use are ineffective. Many of them will kill larvæ but here their usefulness ends. Many have been recommended by hearsay, on the basis of too little investigation, or after experimentation of a meager kind which neglected to include atmospheric conditions and other factors of a more or less variable nature which have an important bearing on the success or failure of the material.

As a result, the most effective work in combating scale insects in greenhouses is done when the plants are overhauled and repotted. At this time badly infested plants are destroyed, infested leaves pulled off, and men and girls are placed at work scrubbing the leaves with tooth brushes, erasers and soft cloths or using pointed sticks to dislodge the scales in cracks and crevices. In other words, laborious hand methods are still the fashion in many greenhouses, not from choice but of necessity.

The following list consists of species which have been definitely found infesting various plants in New Jersey greenhouses. No attempt has been made to give a complete list of food plants, and only those on which the insects were found are recorded. To Mr. E. R. Sasscer, I am indebted for various identifications during the past several years.

ICERYA Sign.

I. purchasi Mask. On acacia, orange, lemon.

ORTHEZIA Bosc.

O. insignis Dougl. On coleus, gardenia, verbena, citrus, chrysanthemum, tomato and other plants.

PSEUDOCOCCUS Westw.

P. citri Risso. On bouvardia, coleus, citrus, fuchsia, croton, ferns, bay trees, tomato, palms, geranium and many others.

P. longispinus Targ. On ferns, citrus, palms, dracena, coleus and many others.

P. pseudonipæ Ckll. On Kentia sp. and Cocos sp.

CEROPLASTES Gray.

C. cirripediformis Comst. On citrus.

C. floridensis Comst. On citrus, oleander.

EUCALYMNATUS Ckll.

E. tessellatus Sign. On palms.

COCCUS Linn.

C. hesperidum Linn. On bay trees, oleander, crotons, begonias, palms, ficus, citrus, cyclamen, orchids, camellia and many others.

C. longulus Dougl. On citrus, ficus, euphorbia, ferns and others.

C. pseudohesperidum Ckll. On orchids (Cattleya and Dendrobium spp.)

SAISSETIA Depl.

S. hemisphærica Targ. On palms, ferns, oleander, croton, orchids, citrus camellia and many others.

S. oleæ Bern. On camellia, citrus.

DIASPIS Costa.

D. boisduvalii Sign. On palms, orchids.

D. bromeliæ Kern. On pineapple, oleo fragrans, latania.

AULACASPIS Ckll.

A. zamiæ Morg. On cycas revoluta.

HEMICHIONASPIS Ckll.

H. aspidistræ Sign. On ferns, aspidistra, pandanus, orchids.

FIORINIA Targ.

F. fioriniæ Targ. On camellia, palms, ficus, orchids and others.

ASPIDIOTUS Bouché

A. britannicus Newst. On bay trees.
A. cyanophylli Sign. On palms, orchids, ficus.
A. hederæ Vall. On orchids, palms, cycads, oleander, citrus, ivy and many others.
A. rapax Comst. On bay trees, palms, camellia.

CHRYSOMPHALUS Ashm.

C. aonidum Linn. On palms, pandanus, ficus, bay trees, camellia, citrus.
C. aurantii Mask. On citrus, palms, pandanus.
C. dictyospermi Morg. On palms, pandanus, latania.
C. perseæ Comst. On orchids.
C. rossi Mask. On orchids.

TARGIONIA Sign.

T. biformis Ckll. On orchids.

LEPIDOSAPHES Schimer.

L. beckii Newm. On citrus, croton.
L. gloverii Pack. On palms, citrus.

ISCHNASPIS Dougl.

I. longirostris Sign. On palms, pandanus.

PARLATORIA Targ.

P. pergandii Comst. On citrus.

The above list verifies most of the records furnished by Dr. W. E. Britton for Smith's 1909 list of "The Insects of New Jersey," and increases the number of greenhouse species from nineteen to thirty-two.

THE HOST OF *ZELIA VERTEBRATA* (DIPTERA, DEXIIDÆ).

BY J. A. HYSLOP,
Bureau of Entomology.

In the April number of this JOURNAL, Volume 22, No. 2, the writer published some observations on the life history of *Meracantha contracta* Beauv. At that time two parasites of this insect were recorded. A third parasite has since been reared, namely, *Zelia vertebrata* (Say). Mr. W. R. Walton in determining this insect said: "The habits of this fly have hitherto been unknown though it is very common in the woods, in fact, one can hardly go into the forest anywhere in this part of the country (about Washington, D. C.), particularly during the months of July and August, without finding this fly sitting around on tree trunks. The females are quite different in appearance from the males." I therefore think it advisable that what little data we have relative to the habits of this *Dexiid* be published.

On April 6, 1915, two larvæ of *Meracantha* were collected under the club moss, *Polytrichium ohiœnsis*. A parasite emerged from one of these larvæ and pupated on May 10 and the adult fly emerged on June 7.

The other larva moulted on May 15 and appeared to be in good health. However, on June 22 a parasite emerged from this lava and pupated. On July 9 an adult *Zelia vertebrata* emerged. These parasitic larvæ had spent at least six weeks within their hosts, and the puparium stage covered from seventeen to twenty-seven days.

DR. FREDERICK WILLIAM RUSSELL.

Dr. Frederick W. Russell, a former member of the Cambridge Entomological Club, died at the residence of his son-in-law, Dr. Frank J. Hall, Dallas, Texas, November 20, 1915, aged seventy-one.

He graduated from Harvard in 1869 and from the Medical Department of the New York University in 1871. A resident of Winchendon, Mass., for many years, he frequently attended the meetings of the club even from that distance. As a member of the Boston Society of Natural History he took a great interest in the work of building up the New England collection of insects and contributed many rare and interesting moths—the group in which he was especially interested. He was a genial friend and companion and the club wishes to express its sorrow in the loss of a friend and fellow-worker.

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Wanted. Ants from all parts of the world.—W. M. Wheeler, Bussey Institution, Forest Hills, Mass.

Florida insects of all orders, also Fish, Batrachians, Reptiles, Shells and Marine Invertebrates sold by A. G. Reynolds, Gulfport, Florida.

New England Orthoptera identified. I wish to examine adult Orthoptera of all families from all parts of New England. Material will be identified for the privilege of retaining desired examples, for which good exchanges will be given, subject to approval of owner.—A. P. Morse, Wellesley College, Wellesley, Mass.

The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's Insects of New Jersey.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

Offered for cash, but exchange preferred. Fitch and early Illinois reports; Insect Life; Harris's Insect; many others.—J. F. Hallinen, Cooperton, Okla.

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Hemiptera-Heteroptera. I desire specimens of this group from all regions, especially New England. I will give in exchange species of this and other orders (except Lepidoptera), and will identify New England material. Correspondence desired.—H. M. Parshley, Bussey Institution, Forest Hills, Mass.

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Wanted: Transactions American Entomological Soc., Vol. 4; Entomological News, Vol. 2, Nos. 6 and 10; Vol. 8, Nos. 1 and 6; Vol. 9, Nos. 1 and 2; Vol. 10, No. 10; Vol. 11, Nos. 1, 3 and 5. Will purchase at reasonable price.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

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VOL. XXIII APRIL, 1916 No. 2

FURTHER STUDIES ON THE PLATYPEZIDÆ.

By Charles W. Johnson.
Boston Society of Natural History, Boston, Mass.

Since publishing a "Revision of the Species of Agathomyia" (Psyche, Vol. 17, p. 7, February, 1910) material has accumulated which I have put aside year after year, hoping that in time I should have sufficient material to show satisfactorily the positive relation of the sexes of what are probably the male and female of the same species. The notes appended to the following description will show the difficulties attending this work, the results of which, after six seasons of careful collecting, being rather discouraging. It is therefore with great misgivings that I name some of the described forms, but by so doing, if synonyms should arise, they can be more clearly and readily relegated to their proper standing, than by referring them doubtfully to described species.

Agathomyia Verrill.

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1. Thorax and abdomen fulvous............................2
Thorax and abdomen largely black........................4
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With black on the abdomen.............................3
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5. Scutellum yellow, ♂, ♀ (N.H., Vt., Mass., R.I.) *pulchella* Johns.
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6. Posterior metatarsi broad, oblong, ♂ (N. Y., Me.) *vanduzeei* sp. nov.
   Posterior metatarsi broad, ovate and truncate, ♂ (N. H., N. Y.)..............................*cushmani* sp. nov.
7. Thorax and abdomen both maculated with greenish white, halteres black (N. H., Mass., N. Y., N. J., Pa., Kan.) *notata* Loew
   Thorax only maculated with greenish white, halteres yellow (Pa., D. C.)..........................*divergens* Loew
   Thorax and abdomen without maculations, tip of the abdomen in the female cinereous, knobs of the halteres black (N. H., Mass.)..................................*talpula* Loew
8. Abdomen grayish on a yellow ground, with broad black triangles..............................*vanduzeei* sp. nov.
   Abdomen grayish on a blackish ground (Mass.) var.? *obscura* var. nov.

Agathomyia dubia sp. nov.

♂. Head black, mouth parts and antennæ yellow, aristæ brown. Thorax and scutellum yellow, pleura and metanotum black, pronotum with three rows of black hairs, the outer rows curving towards the humeri, a post-humeral, four notopleural, two supra-alar and one dorsocentral bristles, scutellum with three small lateral and two large apical bristles. Abdomen fulvous, the terminal segment and genitalia black. Legs light yellow, posterior metatarsi not enlarged, scarcely as wide as the tibiæ. Halteres fulvous. Wing hyaline with a long pale yellow stigma. Length, 8 mm.

One specimen, Austen's Brook, Chester, Mass., August 4, 1911. Type in the collection of the Boston Society of Natural History. I have long hesitated in describing this, and since collecting it have made four additional trips to the locality, hoping thereby to get more material. That it may prove to be the male of *A. fulva* is not unlikely, but the black pleura and terminal segment of the abdomen make it very doubtful, while the presence of another equally closely related form leaves only the one alternative to avoid confusion.

Agathomyia perplexa sp. nov.

♂. Head black, mouth parts and base of the antennæ yellowish. Third joint and arista blackish. Thorax: dorsum and pleura fulvous, with rows of hairs and bristles similar to those of *A. dubia*, scutellum fulvous with four large marginal bristles. Abdomen fulvous, the last two segments and genitalia black. Legs yellow, the posterior metatarsi enlarged, slightly wider than the tibiæ, under side of the anterior and posterior femora with a large black bristle near the base. Halteres dark brownish-black. Wings hyaline, stigma very pale, a large black bristle near the base of the costa. Length, 3 mm.

One specimen, Elma, Erie County, N. Y., August 24, 1913, collected by Mr. M. C. VanDuzee. Type in the author's collection.

In general appearance this could also be referred to as the male of *A. fulva*, but the color of the antennæ, halteres and the last two segments of the abdomen would seem to separate it from that species.

Agathomyia fulva Johnson.

A female identical with the type from Capens, Me., was collected in Tuckerman's Ravine, Mt. Washington, N. H., July 21, 1915.

Agathomyia vanduzeei sp. nov.

♂. Face black, grayish pruinose, mouth parts and antennæ yellowish, third joint and arista black, eyes similar to the following species. Thorax with a dorsal line and the central area behind the transverse suture black, the rest of the dorsum, pleura and scutellum brownish. Abdomen, first segment brown, second and third yellow except for a dorsal spot of brown, the rest of the segments velvety black. Halteres dark brown, base of the stalk yellow. Legs yellow, tip, of the posterior femora brown above, posterior metatarsi slightly dilated, apex rounded (Fig. 2). Wings hyaline. Length, 3.5 mm.

♀. Face and front black, grayish pruinose, a bristle on each side of the front just below the ocelli and a vertical bristle on each side of the ocelli, two small ocellar bristles and a row of small bristles on the posterior orbits. Thorax light gray, with three conspicuous rows of black hairs, the middle row abbreviated posteriorly, the others curved outward in front to the humeri; the hairs become gradually larger and end with a large bristle in front of the scutellum, the latter with four large marginal bristles, humeri, postalar callus and scutellum yellow. Abdomen yellowish, grayish pruinose, with wide triangular markings of black on the posterior margins of the second, third and fourth segnents, fifth and sixth with a narrow dorsal line of black. Halteres yellow, posterior metatarsi not dilated, in other respects resembling the male.

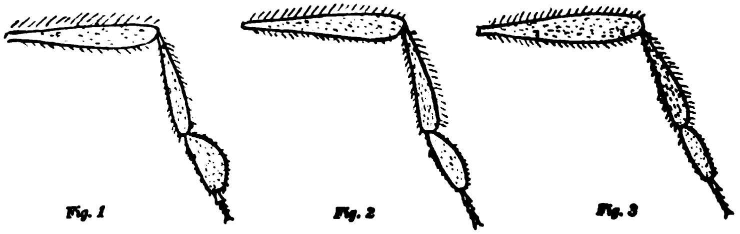

Fig. 1. Portions of hind legs of Agathomyia and Callimyia. Fig. 1, *A. cushmani* sp. nov.; Fig. 2, *A. vanduzeei* sp. nov.; Fig. 3, *C. velutina* sp. nov.

Holotype and allotype, Niagara Falls, N. Y., October 6, 1912 (M. C. VanDuzee), in the author's collection. Paratypes, two females, Colden, N. Y., September 7, 1913, in the collection of Mr. M. C. VanDuzee. One male, Liberty, Me., September 9 (J. A. Cushman) in the collection of the Boston Society of Natural History. The latter measures 4 mm. and has a dorsal stripe of black on the second and third abdominal segments. An imperfect female collected at Hammond's Pond, near Brookline, Mass., September 25, 1913, I am referring doubtfully to this species under the varietal name *obscura*. It lacks the yellow humeri and scutellum, the antennæ are entirely black, and the third joint more attenuated. The abdomen is injured so that the markings are obliterated but no yellow is apparent. Length, 3.5 mm. A number of trips have been made to try and secure more specimens of this interesting form, but in vain.

Agathomyia cushmani sp. nov.

♂. Face black, grayish pruinose, mouth parts and antennæ yellow, third joint and arista dark brown, eyes with a deep median transverse depression, facets of the lower half about one half the size of those of the upper half. Thorax black with three narrow pruinose stripes, bearing rows of fine hairs, the outer rows curving towards the brownish humeri. Scutellum yellowish, pleura black, grayish pruinose. Abdomen, first, second and third segments yellow, a large dorsal spot on the posterior of the third and the remaining segments velvety black. Legs yellow, all of the tarsi and the tips of the posterior femora and tibiæ brownish, posterior metatarsi broadly dilated and truncate, the tarsi short (Fig. 1). Halteres yellow, the knobs brownish. Wings hyaline. Length, 4 mm.

Holotype collected by Dr. J. A. Cushman, on Mt. Passaconaway, N. H., 3,800 feet, September 12, 1912, in the collection of the Boston Society of Natural History. Paratype, Boston, Erie County, N. Y., September 5, 1911 (M. C. VanDuzee), in the author's collection.

This species resembles *A. vanduzeei* but is readily separated by its broader and somewhat truncated metatarsi.

Agathomyia pulchella Johnson.

Since 1910 this species has been collected at Chester, Mass., August 7, 1912; Bretton Woods, June 28, 1913; Mt. Washington carriage road below the second mile post, elevation about 2,400 feet, July 24, 1915, and along the Osgood Trail, near the Glen House, N. H., July 20, 1915.

Callimyia Meigen.

Table of Species

1. Abdomen entirely velvety black, ♂ (N. H., Mass., Ont.) . . . *velutina* sp. nov.
   Abdomen broadly banded with yellow 2
2. Abdomen without silvery gray spots, ♂ (N. M., N. H., Me.) *venusta* Snow.
   Abdomen with silvery gray spots 3
3. Sides of the 1st, 2nd, and 5th segments silvery gray, ♀ . . . *venusta* Snow.
   Sides of the 1st, 2nd, 3rd and 4th and the entire 6th segment silvery gray, ♀ (N. H.) . . . . *proxima* sp. nov.

Callimyia velutina sp. nov.

♂. Face dull grayish black, antennæ black. Thorax, scutellum and abdomen deep velvety black, pleura grayish black. Legs black, anterior and middle tibiæ and tarsi brown, posterior tibiæ and metatarsi somewhat enlarged (Fig. 3). Halteres fulvous, stems brown. Wings hyaline. Length, 4 mm.

This species was collected by the writer along the Mt. Washington carriage road between 2,500 and 3,500 feet, also on the Raymond Path at similar elevations, July 6 to 8, 1914, and July 24 to 28, 1915; at Bretton Woods, N. H., June 28, 1913, and at Chester, Mass., August 5, 1914. A specimen was also received from Mr. M. C. VanDuzee, collected at Brule Lake, Ontario, August 3, 1911. The Chester specimen measures 3.25 mm. and the Ontario specimen, which is about the same size, has the abdomen somewhat shiny, probably owing to its having become damp or greasy.

Holotype (Mt. Washington, July 24) and four paratypes in the collection of the Boston Society of Natural History. One paratype in the Museum of Comparative Zoölogy, one in the collection of Mr. VanDuzee and one in the author's collection.

Callimyia proxima sp. nov.

♀. Front and face black grayish pruinose, antennæ black. Thorax and scutellum black, humeri, a large spot in front of the scutellum and the metanotum grayish pruinose. Abdomen, posterior half of the fifth and all of the second segment except a narrow dorsal line, yellow, the remaining segments black, a large spot on the sides of the second, third, fourth, and all of the sixth segment pearl gray. Halteres yellow. Legs including the coxæ yellow, tips of the anterior and middle tarsi and posterior femora and the entire posterior tibiæ and tarsi black. Wings hyaline. Length, 3 mm.

Two specimens collected on the Mt. Washington carriage road between the two and three mile post, elevation about 3,000 feet, July 16, 1915.

That this may prove to be the female of *C. velutina* is possible, but the bright yellow segments of the abdomen and the legs, which in *C. venusta*, a closely related species, are the same in both sexes, seems to preclude the placing of the two together.

Callimyia venusta Snow.

A male and female of this species previously recorded from Shackford Head, near Eastport, Me., was collected along the Mt. Washington carriage road, above the two mile post, elevation about 3,000 feet, July 16, 1915.

TWO NEW TEXAN PARAJULI.

By Ralph V. Chamberlin,
Museum of Comparative Zoölogy.

The type specimens of the new species of Parajulus here described were collected by J. D. Mitchell at Victoria, Tex., from where they were taken to the field laboratory of the United States Bureau of Entomology at West Lafayette, Ind., and there kept alive for some time. They were sent to me for determination by Mr. W. R. Walton of the bureau mentioned. Isolated descriptions of these two forms are here published in order that the names may be available for early use.

Parajulus texanus sp. nov.

General color light yellowish brown. A dark median dorsal longitudinal line which is dark brown anteriorly and becomes black posteriorly. The usual series of black dots along each side over the repugnatorial glands on all excepting the first few segments; the dots small, angulate. About each segment a narrow dark annulus or line which fades out on the lower part of each side. A series of light brown spots much lighter and less conspicuous than those of the repugnatorial series occur along each side above the legs excepting on the most anterior and most posterior segments. Vertex of head and the antennæ dusky or blackish; the head below level of eyes pale.

Sulcus across vertex of head coarse; extending forwards to a deep transverse sulcus between inner angles of eyes; the transverse sulcus bent back angularly at middle.

Eye patch black; of moderate size; triangular, but with sides convex and the anterior angle truncate. Ocelli on each side in seven subvertical series in the most caudal of which there are ten ocelli, and also forming about ten oblique series. Total number of ocelli in each patch near fifty.

First dorsal plate with the lower border straight, not at all angularly produced. Laterally distinctly margined. With two or three longitudinal striae across caudal border below on each side.

The second and succeeding segments deeply longitudinally striate below on each side. A longitudinal sulcus at level of repugnatorial pore.

Repugnatorial pore moderate or small; a little removed from the suture which is considerably excurved at its level.

Anal tergite with caudal tip acute and subspinous; straight, not at all decurved; exceeding the anal valves.

Anal valves with inner border conspicuously raised, and roughened.

Anal scale with caudal and anterior margins widely and evenly convex, not emarginate, meeting at an acute angle on each side.

Mandibular stipes of male slightly excavated. Strongly produced ventrad.

Promentum of gnathochilarium in the male much enlarged as usual; obovate in outline.

First legs in male strongly enlarged; the penult article narrowing distad, rather long, flattened, very weakly curved. Not strongly uncinate. Inner surface with numerous fine tubercles.

Coxae of second legs in male much enlarged and produced mesally in a linguiform process as usual; the process gradually but not strongly narrowing distad; not enlarged at distal end excepting for a slight extension at each angle.

Exposed part of first division of anterior gonopods of male wide proximally and strongly narrowing distad, the apex obtusely rounded; second or posterior division conspicuously exposed in lateral view, curving above base cephalomesoventrad, then bending more strongly a little caudad of mesad and then strongly back more caudad, the end flattened and the distal edge finely dentate and in contact with that of its mate, the two embracing or lying below a large conical process from the eighth segment.

Posterior gonopods sickle-shaped, crossing each other at the middle.

Number of segments in type, 52.

Length of type, 30 mm.

The description above is of a single male.

Parajulus victorianus sp. nov.

As the specimens of this species had been dried out through the evaporation of the alcohol, the coloration cannot be wholly determined. The dark spots along the sides are decidedly larger than in the preceding species and are less angular, being typically subcircular; they often enclose a light area. In the types no dorsal median longitudinal dark stripe is detectable, though this may be due to the drying and shriveling of the soft parts.

Median sulcus of vertex of head geminate, each half bending sharply ectad at level of eyes and running to the inner angle of eye of the corresponding side and forming part of a transverse sulcus that is angulate at the middle as in the preceding species. Vertex caudally margined, the margining sulcus curving away from the edge on each side as it approaches the middle.

Eye area on each side subpentagonal or subtriangular with the anterior angle broadly obliquely truncate; the caudal side convex as is also the lateral; the mesal side convex or very obtusely angular; the anterior side straight, oblique. Each eye consisting of eight transverse rows of ocelli. Ocelli about 45 in number.

First dorsal plate with lateral border margined, nearly straight; not at all produced below; caudolateral angle subrectangular. Not striate.

Second segment conspicuously longitudinally striate below.

The succeeding segments striate farther dorsad and sonn extending entirely across dorsum.

Repugnatorial pore moderate. Not touching the suture which is weakly excurved at its level.

Anal tergite exceeding the valves; caudal angle as a whole subacute, the apex, however, narrowly rounded; apex short and not extended as a spinous process, slightly depressed.

Mesal borders of anal valves scarcely elevated, roughened.

Mandibular stipes of male with caudal side straight except at distal or lower end where it is abruptly narrowed, leaving a rounded corner or angular projection.

Promentum of gnathochilarium in the male very large, broadly oblong with the sides slightly convex and the corners somewhat rounded, also slightly wider distad.

First legs of male enlarged in the usual degree but longer than usual. The penult article exceptionally long, becoming distally much more slender than the preceding article.

Anterior division of the first gonopods conspicuously clavate; the broad distal end bent caudad, the caudal edge setiegerous; posterior division much longer than the anterior, its base broad but above this narrowing rather abruptly to a blade which curves ventromesad nearly to the middle line, with the posterior angle of the tip extended caudad in a short, slender and very acute process.

The posterior gonopods are broad plates each of which curves first cephaloventrad and then ventrocaudad, the distal portion of the blade narrower but still conspicuously broader than usual, the blade with its broad surface subvertical; the distal end characteristically bifid, the two lobes or teeth short.

The types are broken and as a result the number of segments cannot be accurately determined.

Two broken males form the basis of the description.

In the character of the anterior gonopods this species suggests *P. zakiwanus* Chamberlin, known from New Mexico, but the posterior gonopods are conspicuously different.

THE PUPA OF *BOREUS BRUMALIS* FITCH.

By Francis X. Williams,
Melrose Highlands, Mass.

In the August number of Psyche Dohanian describes and figures *Boreus brumalis*[1] and states that the life-history has not been fully worked out in any species of the genus. The order to which this insect belongs, the Panorpatæ, comprises a small group of neuropteroid forms, among which are the genera *Panorpa*, commonly known as scorpion-flies, *Bittacus* and *Merope*, and whose mouth-parts are borne at the end of a snout-like extension of the head, or rostrum. In general, their life-history is imperfectly known, but the larvæ are said to be terrestrial and carnivorous.

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[1] Notes on the External Anatomy of *Boreus brumalis* Fitch, Psyche, XXII, pp. 120–123, pl. IX, 1915.

On October 4, 1915, I had the good fortune to unearth a number of *Boreus* pupæ at Andover, Mass., some fifteen miles north of Boston. Others were found in this locality up to October 22, and in two separate localities at Melrose Highlands, the first pupa being taken October 6 and the last on November 23. All were found in neat and rather elongate earthen cells in or just beneath the fine root-work of green moss which was growing at the base of trees, chiefly oaks. At the base of one tree I soon found over a dozen. The pupal cells were vertical or inclined and extended to within one half of an inch or so of the surface of the soil. No pupæ could be found under moss other than that which grew at the base of trees.

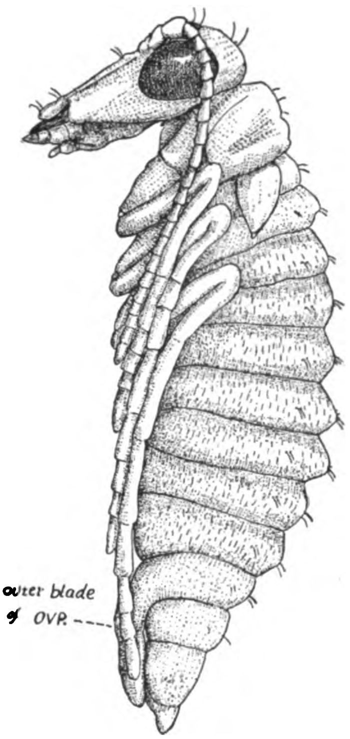

Fig. 1. *Boreus brumalis*, pupa.

The pupa is of the same general shape and size (3.2–3.75 mm.) as the adult. The appendages are free. The mandibles are rather large and 4-dentate and vary somewhat in my three specimens (1♂ and 2♀). The male has two pairs of long, narrow wingcases and the female a single short pair. The male genitalia are terminal and somewhat reflexed and in well advanced pupæ exhibit a stout upturned pair of chitinous clasping organs which are strongly toothed on their concave border. In the female the abdomen terminates in a more or less conical point, which encloses the inner portion of the ovipositor, while the outer blades of the ovipositor are ensheathed in a pair of ventrally appressed appendages that arise from the eighth abdominal segment and do not quite extend to the end of the body. The coxæ are long and stout and probably assist the adult in leaping. There are a few rather long bristles, as shown in the figure, and a short transverse row of little thorns on either side of the mid-dorsal line on abdominal segments 2–5. Under good magnification the surface of the body is finely pointed-granulate. The pupa is at first whitish; but even in the first specimens secured the eyes and mandibles had become quite dark. In well matured examples the body was brownish or greenish yellow and the longer appendages, at first rather closely appressed to the body, showed a tendency to move out of position.

The pupa is easily disturbed and is then decidedly active. The head is moved up and down in a vigorous manner, the mandibles open and shut and the abdomen is twisted around. These movements parallel rather closely those made by the pupa of the Eriocranid moths (Jugatæ) in working their way to the surface of the soil, and it is possible that the movements of the *Boreus* pupa serve the same purpose. Busck and Böving[1] say the following concerning this Eriocranid pupa, p. 155–6: "While all the other appendages are loose, not glued together as is normal in a Lepidopterous pupa, it is mainly the head and the mandibles and abdominal segments, which are movable and utilized in locomotion, when the pupa digs up through the earth." In *Boreus* the pupal mandibles are about as long as two thirds the distance from their base to the lower portion of the eyes, 4-dentate and several times the size of the small 2-dentate mandibles of the adult insect.

Unfortunately almost all my pupæ were destroyed by a fungus, so that I was unable to rear more than a single *brumalis*. Towards the end of November, the pupæ had become very scarce, though what I took to be deserted open pupal chambers were not uncommon locally. With diligent search, however, I managed to find a single, well advanced pupa on November 22, and this, seven or eight hours later, disclosed a fully or nearly fully pigmented and active male *brumalis*. This insect lived for fifteen days confined in a jelly tumbler half-filled with damp moss. It always kept to the higher places and walked about in leisurely fashion, its metallic blackish head glistening in the light. It contrived to escape once, when it traveled by well-directed six-inch hops.

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[1] On *Mnemonica auricyanae* Walshingham, Proc Ent. Soc., Wash., XVI, pp. 151–162, pl. IX–XVI, 1914.

I was unable to find any adults where I had secured the pupæ, though conditions seemed favorable for their presence. The life of the imago must be rather long, however, as it appears to have a somewhat protracted season. So, too, the larval period seems to be rather extended.

It is to be hoped that inasmuch as this curious winter insect is largely confined to the base of trees and is at times not uncommon, the complete life-history may soon be worked out.

A NEMATODE PARASITE OF ROOT APHIDS.[1]

By John J. Davis,

United States Bureau of Entomology, West Lafayette, Ind.

Parasites of root-infesting plant lice are so rarely encountered that this record of a nematode attacking a root aphid is especially interesting. We first found apterous viviparous and oviparous individuals of a new species of *Anæcia* infested with nematodes at Lafayette, Ind., October 16, 1911, and again on October 19, and, although a number of collections were made at frequent dates

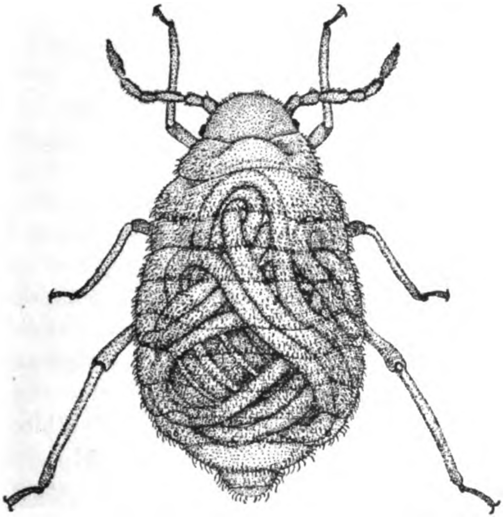

Fig. 1. *Anæcia* sp. infested with a Nematode.

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[1] Published with the permission of the Chief of the United States Bureau of Entomology.

between September 15 and October 15 from nearby plants, no parasitized aphids were found earlier than the dates mentioned above. The aphids were on the roots of *Muhlenbergia* and rather near the surface; that is about a half inch below the surface of the ground. The coiled and twisted worm was visible within the body of the aphid but after clearing and mounting in balsam it became much more distinct. The accompanying illustration, kindly drawn for us by Dr. Henry Fox, is a very characteristic likeness of the nematode worm within the body of the aphid. The nematode proved indeterminable and it is not unlikely that the aphid is simply an intermediary host.

We know of but one other record of a nematode infesting an aphid. Dr. G. Del Guercio, on page 205 of Nuove Relazioni of the Royal Station of Agricultural Entomology of Florence (Vol. I, 1899), records a nematode as one of the natural means which limits the diffusion of *Trama radicis* Kaltenbach, a root aphid, and on the following page gives a simple outline drawing of the nematode worm.

SOME NEW FORMICID NAMES.

By William Morton Wheeler,
Bussey Institution, Harvard University.

Forel's discovery, in 1913, that the East Indian ant, long known under the name of *Aphænogaster* (*Ischnomyrmex*) *longipes* F. Smith (1857), is really a *Pheidole*, and the type of the subgenus *Ischnomyrmex*, makes it necessary to change the name of *Pheidole longipes* Pergande (1895) of southern California and Mexico. I would propose for the latter the name *Pheidole grallipes* nom. nov.

Owing to the fact that I was unable to receive any proof, my recent paper on the ants collected by Capt. S. A. White in Central Australia (Trans. Roy. Soc. South Austr. 39, 1915) contains two unfortunate errors. The name *Polyrhachis* (*Campomyrma*) *longipes* (p. 821), applied to one of the new species, is preoccupied by that of *Polyrhachis longipes* described by Frederic Smith in 1858 from the Aru Islands. I would, therefore, change the name of the Australian species to *P.* (*C.*) *macropus* nom. nov.

Examination of several fine series of *Camponotus* (*Myrmophyma*) *inflatus* Lubbock, the famous honey ant of Central Australia, recently received from the Museum of South Australia, shows that what I described as *Camponotus* (*Myrmamblys*) *aurofasciatus* (p. 817) is merely the hitherto undescribed minor worker of Lubbock's species. Forel is probably right in assigning it to the subgenus *Mrymophyma*.

NEW ENCYRTIDAE FROM NORTH AMERICA.

By A. A. Girault,
Bureau of Entomology, U. S. Department of Agriculture.

Signiphora flavopalliata occidentalis Howard.

Two females from *Chrysomphalus aurantii citrinus*, Avondale, Cal., October 24, 1911. P. H. Timberlake. 14527 D.

Signiphora thoreauini sp. nov.

Female: Length, 0.55 mm. Differs markedly from *aleyrodis* in having the antennal club all black, the cephalic part of the mesoscutum is only slightly darkened, the band on the abdomen is slightly shorter. From *basilica* in lacking the disto-marginal spot on the abdomen, the less colored cephalic thorax, the wholly black club and its greater length. From *lutea* as from *aleyrodis* and in its greater slenderness.

From one female on a slide labelled "From *Aspidiotus hederæ* on Soy, Santa Barbara, Cal., November 14, 1911. P. H. Timberlake. 14594 C." *Type:* Catalogue *No. 19209*, U. S. N. M., the above specimen.

Neosigniphora elongata sp. nov.

Female: Length, 1.35 mm. Rather long in proportion to its width. Agrees with the description of *Signiphora australica* Girault (the legs, however, dark except the yellow tarsi and the yellow dusky front legs); fore wings clearer near tip and under all of submarginal vein; the marginal cilia at apex are over half the greatest wing width. Hind wings broad. Differs notably from *australica* in the antennal club which is slender, six or more times longer than wide. Scape long and slender, the pedicel not half its length.

Described from one female on a slide labelled "Webster No. 11824, Elkpoint, S. D., March 28, 1914. Reared from a coccid on *Muehlenbergia*, C. N. Ainslie." The four ring-joints in the genotype are verified. *Type:* Catalogue *No. 19210,* U. S. N. M., the foregoing female.

Aneristus oculatipennis sp. nov.

Female: Length, 1.65 mm. Black, the tarsi white; apex of scutellum very narrowly around the margin and a broad band across the scutum just back of the cephalic margin, yellowish white; band on scutum occupying somewhat over a third of the surface. Propodeum centrally at apex suffused with yellowish. Body very finely scaly, the head and thorax with numerous, small setigerous punctures, densest on the scutum. Cephalic femora strongly compressed. Fore wings hyaline but with a large, three-fourths-complete circular smoky ring from somewhat less than the distal two thirds of the marginal vein and extending beyond the venation, its open fourth facing the caudal wing margin and partly closed by a fainter dusky stripe opposite the opening and along the caudal margin; the distal margin of the ring is less than its width (not diameter) from the blade's apex; this ring makes a central, large ocula some distance distad of middle, opposite distal marginal vein. Stigmal vein sessile, minute, globular. Middle tibial spur long and *stout* as in normal encyrtids. Axillæ advanced. Parapsidal furrows mere sutures. Caudal femora and tibia compressed, the tibiæ with stiff black bristles dorsad and with two stout, black, subequal spurs. Mandibles broadly subtruncate but bidentate as in *Baoanusia,* the first tooth shorter than the large truncate second one. Scape pale beneath; flagellum subcylindrical, the funicle joints a little flattened, 1 nearly as long as the scape, three-fourths longer than wide at apex, 3 a little longer than wide, much larger than the pedicel; club 1 slightly wider than long. One distinct ring-joint. Maxillary palpus 2-jointed, the second joint ending in a long slender bristle; labials 1-jointed and similarly terminated. Club well-defined.

From five females reared from *Saissetia oleæ,* Catacaos, Peru. The date of the rearing is September 14, 1912. Rust, collector.

Types: Catalogue *No. 19211*, U. S. N. M., four females on two tags plus a slide bearing appendages.

Nebaocharis gen. nov. (Ectromini)

Female: In Ashmead's table runs to *Anusia* Foerster but differs in having the antennal club solid, the ovipositor exserted for three fourths the length of the abdomen, wings are present in the shape of large scales and the head is not so long, not so narrowed beneath the eyes, the cheeks short. Also the pronotum is less conical, shorter than the scutum or scutellum. Abdomen slender, depressed, its segments very indistinct. Head subquadrate but somewhat narrower toward the mouth (cephalic aspect), the face lenticular but the short, rather shallow scrobes forming a short semi-circle. Axillæ apparently rather widely separated. Hind tibial spur single. *Type*: *N. hemipterus*, sp. nov.

Nebaocharis hemipterus sp. nov.

Length, 1.00 mm. Dark brown, the abdomen, antennæ, extruded valves of the ovipositor and the hind legs, purplish black; scutellum nearly black. Legs, including the caudal tibia just below knee and the caudal tarsus, yellow. Body glabrous or nearly but the head coarsely scaly. Pedicel not flattened, slightly longer than wide, slightly longer than funicle 3 which is slightly the longest, 6 subequal to 2, 1 cupshaped and smallest, all wider than long and compressed; club conical, no wider than the funicle and about half its length. Scape greatly dilated. Flagellum clothed with very short hairs.

Described from one female in the U. S. N. M. collections, labelled "Colorado, 2019. C. F. Baker." *Type:* Catalogue *No. 19312*, U. S. N. M., the specimen on a tag, the head and a hind leg on a slide.

Xanthoencyrtus Ashmead (= *Scelioëncyrtus* Girault.).

The original description of Xanthoencyrtus disagrees with my own of *Scelioëncyrtus*, which is correct. The club is 2-jointed, and the genus must at present be regarded as an Ectromine. *Xanthoëncyrtus nigroclavatus* Ashmead appears to be common in the United States; through the Bureau of Entomology I have seen a series of both sexes labelled "Webster No. 11811, Elkpoint, S. D.

C. N. Ainslie, collector. Parasite reared from Panicum coccid." The male club is solid, the funicle joints distinctly longer than wide, with scraggly hairs. There are three Australian species.

Epanusia albiclava sp. nov.

Female: Length, 1.20 mm. Dark metallic purple, the fore legs (except the coxæ) reddish brown, the middle tibiæ and tarsi and the club yellowish white. Head sculptured as in the genotype. Fore wings embrowned from near base to apex and crossed by a broad, naked hyaline band from all of the marginal and as much of the submarginal veins. Oblique hairless line not differentiated. Head bombyciform (as in the honey bee), a distinct carina between the antennæ, the scrobes running half way up the face but not joining, the face sublenticular. Axillæ slightly separated. Dorsal thorax sculptured and clothed as in the genotype. Marginal vein two and a half times longer than wide, postmarginal vein a little longer than the stigmal, somewhat shorter than the marginal. Fore wings rather narrow for the family but still large. Funicle widest at 2, 1 triangular and longest, widest distad, 6 smallest of the funicle, slightly longer than wide; club cylindrical. Mandibles small, their equal teeth acute. Ovipositor as in *Anagyrodes.*

From a female in the U. S. N. M. collection, taken by sweeping in the fair grounds, D. C., October, 1883. *Type:* Catalogue *No. 19313,* U. S. N. M., the above specimen and a slide bearing a head, fore wing, antenna and portion of a hind leg.

Epidinocarsis subalbicornis sp. nov.

Female: Length, 1.50 mm. Dull black, including the venation, the wings hyaline, the antennæ distad of funicle 1 pure white; also the apex of the pedicel obliquely ventro-proximad and a stripe across the scape near its apex. Mesopleurum orange yellow, except at caudal margin. Tegulæ white at base. Propleurum whitish. Legs white except hind coxæ. Marginal vein a little over twice longer than wide, subequal to the stigmal, the postmarginal very short; hairless line closed caudad, rather broad, the wing ciliated proximad of it to base. Pedicel over twice longer than wide at apex, somewhat shorter than funicle 1 which is fully 2½ times longer than wide and longest. Funicle 6 a third longer than wide. Thorax very densely, minutely scaly and hispid, the very short stiff hairs white; a carina between the axillæ. Abdomen and head sculptured like the thorax, the head pubescent like the thorax. The apex of the acutely triangular scutellum reaches base of the abdomen. Scrobes distinct yet the head sublenticular. Frons moderately broad, the lateral ocellus its own diameter from the eyes.

Described from two females labelled "State Insectary, Cal., 675 A, Fresno, Cal., associated with mealy bugs on grape." *Types:* Catalogue *No. 19314*, U. S. N. M., two females on tags plus a slide with female head and fore wing. One of the females is a paratype.

Formicencyrtus gen. nov. (Encyrtini)

Female: Head ant-like, held nearly horizontally. Runs close to *Anusia* Foerster but the abdomen is somewhat as in *Anastatus*, that is depressed (the ovipositor shortly extruded) but in shape it is broadly oval (dorsal aspect), the second segment occupying about half of the surface, segment 6 two thirds as long as 2, the others short. The wings are like large scales but veinless and inconspicuous. Otherwise agrees with the structural characters of *Anusia flava* Girault except that the scutellum is not triangular but round at apex and there is a minute third mandibular tooth. *Type: F. thoreauini*, sp. nov.

Formicencyrtus thoreauini sp. nov.

Female: Length, 1.58 mm. Reddish brown, the propodeum darker, the abdomen dorsad metallic purplish, yellowish at apex, the funicle and club black, the short, extruded part of the ovipositor whitish. Fore wing gradually narrowing distad, somewhat over three times longer than wide at base, hispid, with minute scattered marginal cilia. Mandibles with two equal acute teeth and a third very minute obtuse one. Hind tibiæ with one long, slender spur. Scutellum and axillæ lemon yellow. Body coriaceous to subglabrous, the propodeum glabrous, non-carinate, pubescent laterodorsad. Axillæ with a very short carina between them, together with the scutellum opaque and more coriaceous than the rest of the body. Dorsal abdomen downy, the hairs white and reclining. Tegulæ large; scutellum, scutum and propodeum of about equal length. Dorsal thorax very sparsely hairy. Caudal margin of segment 2 of the abdomen slightly concavely incised at the meson. Pedicel normal, slightly longer than wide at apex and than funicle 1, the latter longest but only slightly so, the joints all somewhat wider than long. Club obliquely truncate from the base of joint 2. Scape very greatly foliaceously dilated ventrad. Funicle compressed. Genal suture absent.

From two females on tags in the U. S. N. M. collections labelled "5817^{02}. On *coccus confusus*. Mesilla Park, New Mexico. Cockerell. Emerged December 14, 1896." *Type:* Catalogue *No. 19315*, U. S. N. M., the two females on tags and a slide bearing a hind leg, a wing and a head. One female a paratype.

Zaommoëncyrtus submicans Gen. et sp. nov. (Encyrtini)

Female: In my table of the earth's genera runs to *Zaomencyrtus* Girault but differs in having the scape foliaceously dilated, the funicle joints annular; the stigmal vein is subequal to the marginal which is twice longer than wide, twice the length of the postmarginal. Hind tibial spur short, single, distinct. The middle tooth of the mandible is distinctly longest, the first shortest, a minute tooth, distinctly shorter than the others; third tooth half the length of the middle one. Head quadrate (cephalic aspect). Frons very broad. Eyes round-oval, about as long as the cheeks. Vertex rather thin. Face in death circularly depressed, the frons depressed. Axillæ separated distinctly for some little distance, the suture separating from the scutellum delicate. Form slender, rather flattened, not elongate. Head somewhat as in *Spalangia* but shorter.

Female: Length, 1.00 mm. Shining purplish black, the wings lightly dusky from about the bend of the submarginal vein, the duskiness accented under the head of that vein and under the marginal vein; tibiæ, except just below the knees and the tarsi yellow. Venation fuscous, the stigmal vein paler. Body very delicately scaly, shining like the surface of tar. Second joint of club obliquely truncate, longest, the club enlarged and barely shorter than the funicle. Pedicel stout, slightly longer than wide; funicle joints enlarging distad, 6 over thrice the size of 1 or 2 or 3 which are annular and subequal. Pedicel over a third the length of the body of the scape. Hind wings with about fourteen rows of discal cilia. Fore wing with a white streak caudad from the proximal margin of the discal ciliation, parallel with the caudal margin.

Oblique hairless line rather broad with but several lines of cilia proximad of it. Abdomen no longer than the thorax, the ovipositor tipping it.

From six females "Hopk. U. S. 10958 c., July 27, 1914. On *Nyctobates pennsylvanica*, Shiremantown, Penn. Hicoria. W. S. Fisher." *Type:* Catalogue *No. 19316* U. S. N. M., a female on a tag; five female paratypes.

Ceraptroceroideus Gen. nov. (Encyrtini).

Female: In my table of genera runs to *Ceraptrocerus* Westwood but wingless, the head is not oblong but subquadrate (cephalic aspect) and the second segment of the abdomen occupies nearly half of the surface, the sixth next largest, two-thirds the length of the second. Pronotum extremely short. Scutum wider than long but as long or nearly as the normal scutellum whose rounded apex reaches to the base of the abdomen. Axillæ separated for some distance. Vertex flat, the face inflexed, the frons prominent. Vertex of moderate width. Mandibles with the inner two teeth formed by a concaved broad second inner tooth whose lateral or dorsal apex is acute. Fore wings mere scales which are somewhat longer than wide, with a broad costal cell and distinct submarginal and marginal veins, the latter much shorter than the former. Middle tibial spur long and stout, the caudal spur single, slender. Ovipositor slightly extruded, pointing the abdomen. *Type: C. cinctipes*, sp. nov.

Ceraptroceroideus cinctipes sp. nov.

Female: Length, 1.10 mm. Purplish black, the scutellum except lateral and caudal margins narrowly and the rest of the dorsal thorax, except the tegulæ and much of the surface of the scutum, reddish brown. Head purplish black, the vertex bright lemon yellow, except the lateral margins unnarrowly along the eyes and the cephalic margin broadly. Face with a broadly curved, narrow lemon yellow stripe across it just under the vertex far dorsad of the antennæ, its (lateral) ends terminating under the eye ends. Lateral ocellus in the mesal margin of the lateral black border of the vertex, over its diameter from the eyes. Head finely scaly. Eyes partly on the vertex, the cheeks longer than them. Cephalic legs purple except tips of the tibiæ broadly and the four proximal tarsal joints.

Middle legs purple except the same tarsal joints and the distal two-thirds of the tibiæ, this latter white portion with a black *cinctus* at its middle. Caudal legs all purple, except the three proximal tarsal joints and a broad white *cinctus* a little proximad of the middle of the tibiæ. Abdomen shining, subglabrous. Dorsal thorax scaly, the scutellum more densely so; scutum with sparse pubescence. Antennæ wholly flat. Pedicel triangular, slightly longer than funicle 6. Scape greatly dilated. Funicle joints decreasing in width, increasing in length distad, 6 somewhat wider than long, 1 over twice so, all the joints with their distal margin concave. Club conico-cylindrical, its first joint subquadrate, largest. Fore wings with black, scattered stiff bristles disco-distad and from its cephalic margin, with a fuscous dash across at the thickening of the submarginal vein, a dusky spot against the apex of the venation and an irregular dusky blotch across the apex.

What appears to be the male is very different—winged, the marginal vein somewhat longer than wide, the postmarginal just developed, the stigmal very short, half the length of the marginal. The wings are hyaline and fully developed. Vertex flat but shorter than in the female, the frons less prominent. The antennæ are filiform, the club solid, the scape only compressed-cylindrical, somewhat shorter than the club; pedicel globular; funicle joints cylindrical, 1 longest, nearly twice longer than wide, 6 somewhat longer than wide. Funicle and club with rather long, scraggly hairs. The legs are concolorous except the proximal four tarsal joints of the first two pairs of legs, the proximal joint of caudal tarsi, the cephalic knees and tips of cephalic tibiæ, middle knees and tips of middle tibiæ and a white central cinctus on middle tibiæ (therefore, two concolorous cincti; the knees include the base of the tibiæ and the apex of the femur). The fore femur, caudal femur and tibia are compressed. The head of the male is wholly concolorous.

Described from two males, one female "From *Aspidiotus helianthi* Parr on *Eugerion canadense,* Wellington, Kans., October 8, 1908. E. G. Kelly." *Types:* Catalogue *No. 19317,* U. S. N. M., the above specimens on tags with a slide bearing a male head and fore wing and female head, legs, antenna and fore wings. One male a paratype.

Paracopidosomopsis Gen. nov. (Encyrtini).

Female: The same as *Berecyntus* Howard but the mandibular teeth are small and subequal. *Type: B. floridanus* Ashm.

This species is closely allied with the so-called *Copidosoma truncatellum* Dalman (at least specimens from Europe in the U. S. National Museum, so labelled) which is congeneric, but the American species differs in having a distinct, rectangular fuscous patch against the stigmal and marginal veins with a more suffused area caudad of it, while in the European species the wings are hyaline. Otherwise the two are certainly much alike. Mr. A. B. Gahan has identified a series of *floridanus* as *truncatellum* but for the present I do not think the two can be regarded as the same. These specimens were labelled "Laf. 11. Lafayette, Ind., J. J. D. Reared from cabbage Plusia larva."

Berecyntus Howard.

In my table of genera runs to *Copidosomopsis* Girault but differs in the following essentials: The marginal vein is somewhat longer than wide, the postmarginal distinct, about half the length of the marginal, the abdomen is broader, flat and subcordate, the stigmal vein is slightly longer than the marginal. Axillæ rather broadly joined. Mandible with the third tooth minute, the first long, over twice the length of the second which is over four times the size of the third. Ring joint very minute. Club solid, obliquely truncate. Hind tibial spur single, the middle one enlarged. Genal suture absent. Scrobes not reaching to the middle of the face yet distinct, of tolerable length, forming an inverted "V." Club wider than the funicle and about three fourths its length.

Berecyntus bakeri Howard, var. **gemma,** var. nov.

Female: Length, 1.15 mm. Metallic blue-green, the middle knees and all tarsi except the distal joint, reddish-brown, the venation blackish, the fore wings lightly infuscated from the head of the submarginal vein distad to the apex. Funicle joints increasing gradually in width distad, 1 quadrate not half the length of the pedicel, subequal to 2, 6 somewhat wider than long. Pedicel distinctly longer than wide at apex, nearly half the length of the club which is a little shorter than the body of the scape. Hind wings with about sixteen lines of uniform discal cilia where broadest. Fore wing with only about two short lines of coarse cilia proximad of hairless line. Whole body scaly reticulate. A very short, delicate carina between the axillæ. Scutellum more finely scaly than the scutum. Ovipositor not prominent.

The male is similar to the female but the scutellum is scaly like the rest of the thorax, the funicle joints all somewhat longer, subquadrate, the club shorter; the third tooth of the mandible is longer, the other shorter. Wings hyaline.

Described from a male and a large number of females labelled "From an *Euxoa* larva, Queensboro, Ontario. A. Gibson;" also "from larva of *Hadena devastatrix*, Ottawa, Canada, July 12, 1914. A. Gibson." *Types:* Catalogue *No. 19318*, U. S. N. M., 8 females on five tags (seven paratypes).

Differs from the typical form in having the fore wings narrower and the venation black; both forms bear a rectangular fuscous patch along the stigmal vein. Type locality, Ottawa.

Berecyntus bakeri Howard var. **arizonensis** var. nov.

Female: Differs from *bakeri bakeri* in having the fore wings distinctly more dusky, infuscated throughout from the bend of the submarginal vein.

Described from four females from Phoenix, Ariz., March 20, 1915. From *Choraxagrotis* species. H. O. Marsh, Chtn. No. 978. *Types:* Catalogue *No. 19319*, U. S. N. M., the above specimens on separate tags; three paratypes, one type.

THREE NEW NORTH AMERICAN SPECIES OF THE GENUS *AGROMYZA* (DIPTERA).

By J. R. Malloch,
Urbana, Ill.

Herewith are presented descriptions of three undescribed species of *Agromyza* from Illinois. The type specimens are deposited in the collection of the Illinois State Laboratory of Natural History.

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Agromyza subangulata sp. nov.

Male: Black. Head black, only the apex of proboscis yellow; frons opaque, brown-black, orbits subshining; lunule whitish pollinose. Thorax shining black, disc of mesonotum distinctly brownish pollinose, central vertical suture and upper margin of pleuræ from wing base nearly to anterior extremity narrowly lemon-yellow; roots of wings lemon-yellow; scutellum concolorous with disc of mesonotum. Abdomen unicolorous glossy black. Legs black; fore knees and bases of tarsi yellowish. Wings clear, bases of thick veins lemon-yellow, remainder brown. Squamæ pale yellow, fringe concolorous. Halteres pale yellow.

Frons more than a third the width of head; orbits distinct, each at widest part about half as wide as is center stripe at same part; five orbital bristles present, which are of moderate length, slightly decreasing anteriorly, the anterior two pairs incurved; orbital hairs sparse; antennæ small, third joint disc-like, slightly pilose; arista bare, tapering, its length about one third more than anterior width of frons; face very slightly receding below; cheek very narrow, at middle about one eighth as high as eye, the latter about one and a third times as high as long; marginal hairs not very numerous, but distinct, vibrissa moderately differentiated. Mesonotum with four pairs of dorso-central bristles; discal setulæ rather long and hairlike, about eight rows between the anterior dorso-centrals; the pair of bristles between the posterior dorso-centrals hardly distinguishable from the discal setulæ. Abdomen ovate; surface with many setulose hairs; hypopygium of normal size. Legs normal; mid tibiæ with the posterior bristles small. Wing with costa to end of fourth vein; veins 3 and 4 distinctly divergent at apices, reaching wing margin at about equal distances before and behind wing tip respectively; inner cross-vein in vertical line with apex of first vein, and distinctly beyond middle of discal cell; outer cross-vein distant its own length from inner; last section of fourth vein four times as long as penultimate section; last section of fifth subequal with the preceding section; auxiliary indistinct but complete; sixth vein reaching three fourths of distance to wing margin. Length, 2.5 mm.

Type locality, St. Joseph, Ill., May 3, 1914 (Hart and Malloch). Food plant unknown.

This species will "run down" to *angulata* Loew in my table of species in this genus,[1] but may be readily separated from it by the characters of the wing venation.

Agromyza albidohalterata sp. nov.

Male: Black, shining. Frons with center stripe reddish yellow, ocellar region, and orbits except their lower portions black; antennæ reddish yellow; arista brown; face and cheeks grayish yellow, the former slightly blackened on center and mouth margin; proboscis yellow; palpi brownish; back of head black. Thorax without any yellow markings, the suture between upper portion of pleuræ and mesonotum brownish, no distinct surface pollinosity. Abdomen more distinctly shining than thorax, the segments unicolorous black. Legs black, knees brownish; all tarsi yellowish except at apices. Wings clear, veins brown. Squamæ whitish, margins and fringes grayish. Halteres yellow, the knobs white. All bristles black.

Frons nearly half the width of head, orbits distinct, each about half as broad at its broadest part as is center stripe at same part; orbital bristles situated close to inner margin of orbits, five pairs present, the upper pair rather weak, the others becoming successively weaker towards anterior margin, the last (anterior) pair very weak, anterior three pairs incurved; no distinguishable orbital hairs; antennæ rather small, third joint rounded, its surface with white pile; arista rather thick, its length about equal to anterior width of frons, pubescence very short; cheek nearly twice as high as third antennal joint and half as high as eye, marginal hairs weak, vibrissa not well differentiated; height of eye one and a third times its length. Mesonotum with two pairs of very weak dorso-central bristles, the disc covered with rather closely placed hairlike setulæ; scutellar bristles weak, the pairs subequal in length. Abdomen slightly longer than thorax, the segmentation very distinct, surface hairs weak but numerous; hypopygium normal. Legs normal in shape; mid tibiæ without discernible posterior bristles. Wings normal in shape; first costal division more than three fourths as long as second; third vein ending midway between apex of fourth vein and apex of second; fourth ending almost exactly at apex of wing, these three veins distinctly divergent on their last section;

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[1] See Ann. Ent. Soc. Amer., Vol. 6, 1913, p. 271.

inner cross-vein distinctly before end of first vein and two fifths distant from apex of discal cell; outer cross-vein distant about its own length from inner, and very slightly beyond end of first vein; last section of fourth vein about two and a half times as long as the preceding two sections combined; penultimate section of fifth about two thirds as long as last section. Halteres with exceptionally large knob. Length, 2 mm.

Type locality, St. Joseph, Ill., May 17, 1914 (C. A. Hart). Food plant unknown.

This species will "run down" to *varifrons* Coquillett in the table previously referred to, but may be separated readily by the color of the frons and by the wing venation. In *varifrons* the black of the frons is not confined to the orbits and ocellar region, but extends over the central stripe, on its upper third at least. The last section of fifth vein of wing in the same species is subequal in length with the preceding section, and the second costal division is nearly twice as long as the first.

Agromyza nigrisquama sp. nov.

Female: Black, subopaque. Wings clear, veins black. Squamæ black-brown, fringes concolorous. Halteres yellow, knobs lemon-yellow.

Frons with center stripe opaque, orbits slightly shining, each about one fifth as wide as center stripe, width of frons at vertex slightly over one third the head width, a little narrowed anteriorly, 4 pairs of bristles on orbits, the anterior 2 pairs incurved, the posterior 2 pairs reclinate, orbital hairs sparse; antennæ of moderate size, second joint with distinct dorsal bristle, third joint rounded; arista bare, tapering at base, its entire length equal to from its base to upper orbital bristle; cheek about one sixth the eye height, marginal bristles weak, vibrissæ well differentiated. Mesonotum with 4 pairs of dorso-centrals, the anterior pair in front of suture; no distinct bristles between posterior dorso-centrals; discal setulæ in about 8 irregular rows between anterior dorso-centrals. Abdomen with rather long hairs, especially at apex; ovipositor short, obtuse. Legs slender, the mid tibial setulæ present. Wings broad, costa to end of fourth vein; inner cross vein at distinctly beyond middle of discal cell and slightly before end of first vein; outer cross vein at about its own length from inner; last section of fourth vein 6 times as long as penultimate section; veins 3 and 4 gradually divergent on their last sections; last section of fifth vein about one third longer than penultimate section. Length, 2 mm.

Type, Monticello, Ill., June 28, 1914 (J. R. Malloch). Taken by sweeping vegetation on bank of Saugamon River. Food plant unknown.

This species will "run down" to section 34 in the table referred to previously, but may be separated from both of the species therein by the comparative lengths of the last 2 sections of fifth vein as well as other characters. Both *isolata* Malloch and *fragariæ* Malloch have the last section of the fifth vein shorter than the penultimate section.

A NEW SPECIES OF THRIPOCTENUS (Chalcidoidea).[1]

By L. T. Williams.

During an afternoon's collecting in a swampy spot near the Arnold Arboretum, Forest Hills, Mass., a few galls on willow twigs were secured and brought into the laboratory at the Bussey Institution. A casual examination on the date of their collection (July 22, 1915) showed that they contained immature insects of some sort, but no further attention was paid them until August 10, when the galls were opened and found to contain several large black thrips, and a single minute Chalcidoid parasite. Any possible doubt as to the relationship between the insects was removed when the parasite was identified by Professor Brues as belonging to the genus *Thripoctenus*, which is known to be an enemy of the Thysanoptera.

The genus *Thripoctenus* was proposed in 1911 by Crawford for a new species from California, belonging to the sub-family Tetrastichinæ, and described by him under the specific name of *russelli* in honor of its discoverer, the late Mr. H. M. Russell. A second species has recently been described in Europe by Vuillet. I have not had access to this description but the differences in habitat and in the systematic positions of the hosts would indicate that the present species is perfectly distinct. The characters distinguishing it from the type species are well marked, as will be noted later.

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[1] Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 112.

The following description contains certain characters of generic, rather than specific value, which are included merely for convenience in identifying specimens.

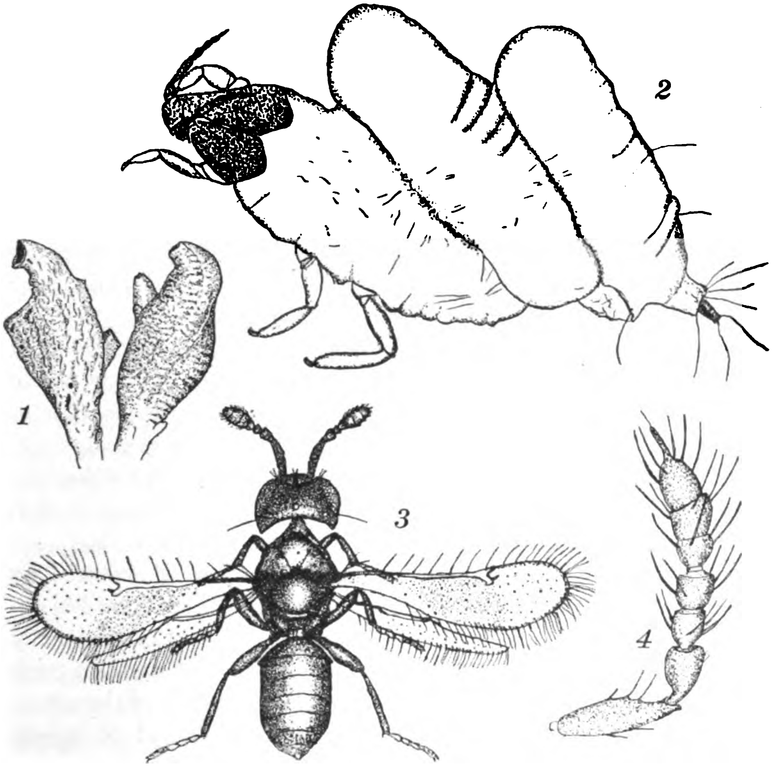

Fig. 1. 1, Willow galls occupied by thrips; 2, Parasitized thrips containing three larvæ of *Thripoctenus nubilipennis*; 3, *Thripoctenus nubilipennis* ♀; 4, Antenna of same, ♂.

Thripoctenus nubilipennis sp. nov.

Female: Length, 0.7–0.9 mm. Antennæ inserted just above the clypeus, 7-jointed, the club of 3 segments and the funicle of 2, the latter shorter than the pedicel. Head as wide or slightly wider than the thorax, seen from in front distinctly wider than long. Clypeus with a distinct keel. Front broad, strongly concave. Inner eye-margin with a row of bristles, the posterior one long and conspicuous. Ocelli in a low triangle. Genæ prominent, well-developed. Mesonotum convex, somewhat cordate, owing to a posterior cleft or indentation. Parapsidal furrows incomplete, indistinct during life. Scutellum oval, without longitudinal furrows. Tegulæ with a pair of bristles. Abdomen elongate-ovate, about as long as the thorax, laterally keeled or compressed. Ovipositor scarcely visible when at rest. Color, black, highly polished, tarsi, except for dusky terminal joints, testaceous. Antennæ dark, but translucent, hence appearing yellowish when mounted; clothed with whitish hairs. Eyes very dark russet-red, almost black; ovipositor yellow, transparent. Wings with a distinct median cloud, and a marginal thickening or pigmentation extending from the end of the post-marginal vein to a point on the posterior margin opposite the stigmal vein. Wing-cilia very long, dark-colored.

Male: Smaller (on the average) than the female, abdomen slenderer more abruptly tapering. Antennæ 7-jointed, as in female, but differing as follows: scape broader, pedicel shorter than the funicle, club much less marked. Joints of the flagellum with whorls of bristles. Terminal joint with a rod-like, bristle-tipped prolongation, about two-thirds as long as the joint. Color, as in female.

This species is very readily distinguished from *T. russelli* by its uniformly black color and clouded wings. The rod-like appendage of the male is very curious and distinctive, though it may pass for an ordinary bristle if not closely examined under a compound microscope. I presume that it is characteristic of the genus, though I have no means of knowing this, the male of *T. russelli* being as yet undescribed.

Habits of the Hosts.

Specimens of the thrips were sent for determination to Dr. J. D. Hood of the Biological Survey, who kindly identified them as belonging to two species, *Megalothrips spinosus* Hood and *Cryptothrips rectangularis* Hood, both members of the family Phlœothripidæ. Unfortunately, the larvæ of the two forms were not distinguished during the course of my observations, and it is impossible to ascertain at present whether their relations to the parasite are different, but it seems probable that either is attacked without discrimination.

After the parasite's relation to the Thysanoptera had been established the locality where the galls had been collected was re-visited, and large numbers of additional specimens secured from time to time. These galls were not, of course, the work of the thrips. They were practically all on dead wood, and may have been several seasons old. The commonest type, and that most frequented by the thrips was the one shown in Fig. 1, 1, but the insects were also found in other sorts, among them the well-known "pine-cone" willow gall. The original inhabitant of the gall is therefore of little importance, since the thrips evidently occupy any sort that will accommodate them.

The galls are not a mere temporary shelter, as all stages of the thrips from the egg to the adult were to be found in them, and none were found outside, upon the twigs. There seem to be no definite generations, all stages being obtainable at any time during the period for which they were under observation. What they eat, unless they are able to subsist on the dry wood of the gall, seems a mystery, the dead willows being the only visible source of nourishment. The other insects found in the galls are scarcely sufficient to permit of a regular carnivorous habit, although occasional cannibalism is not unlikely.

Habits of the Parasite.

The life-history of *Thripoctenus russelli* has been studied in detail by Mr. H. M. Russell of the Entomological Bureau. The writer has not been able to treat the present species so exhaustively within the time at his disposal, but the details gathered show many points of similarity between the two species as well as several interesting differences.

Oviposition: On the 16th of August no parasites had issued from the new lot of galls, and to hasten matters a number were cut open, several female parasites rewarding the search. Two or three of these were placed in a vial with an immature thrips. At first they ran around without paying any particular attention to it, but before very long one of them ran up, examined the thrips briefly with its antennæ, and then immediately thrust its abdomen forward between its legs and punctured the larva with its ovipositor. After a moment, however, it relinquished its attempt for no apparent reason. Later the same thrips was approached by a parasite (No. 1) which went through the preliminary motions of oviposition, but before it had completed the action another (No. 2) ran up and pierced the thrips with its ovipositor. After remaining in this position some minutes its applied its mouth to the puncture and sucked the wound for about the same length of time. Meanwhile No. 1 repeatedly brought its abdomen forward as if to oviposit, but failed to do so. Both insects immediately afterwards deposited something on the wall of the test tube, which may have been merely excrement, though in the case of No. 1 it was shaped very like the usual parasitic egg.

Subsequently, numbers of adults and pupæ of the *Thripoctenus* were obtained, and the process of oviposition was frequently witnessed. The thrips and parasites (one individual of each, as a rule) were placed on a glass side within a ring of paraffin, and covered with a cover-slip. Under these unnatural conditions the behavior of the parasites was somewhat capricious. Their first action was almost invariably a systematic examination of their prison, out of which, if there was the smallest space between the wax and the cover they usually succeeded in forcing their way. After these efforts had been brought to a conclusion they might or might not show some interest in the thrips. Often they remained with their antennæ applied to the bodies of the larvæ, without attempting to oviposit. Under such conditions any slight movement on the part of the thrips was likely to stimulate the parasites to action. If they met with the thrips at an unfavorable angle they seldom rectified their position, but let it go. The thrips also showed some variation in their receptions of the attack. They were generally rather quiescent, but sometimes crawled about rapidly in their endeavor to escape. This was usually successful, especially if done just as oviposition commenced, but occasionally a more persistent parasite followed its prey, sidling along to the best of its ability, and still holding on when dragged head-long, or circumvented its victim by mounting on its back. Sometimes the thrips, particularly the pupal forms, protected themselves by violently contorting the tips of their abdomen, and in one case one of them was seen to excrete a drop of brownish fluid on the wings of the Thripoctenus.

Oviposition, when successful, usually required ten or fifteen minutes, and a half-hour was not uncommon. After this there was normally a rather long period of sucking the wound, followed occasionally by a second oviposition. This last, however, was seldom allowed to occur, as I desired to obtain as many parasitized thrips as possible, and usually replaced the infested individuals with fresh ones. There was no particular point selected for attack, though the abdomen was more often pierced than the thorax. In the length of time required for oviposition the species differs markedly from *T. russelli*, which is described as taking less than a minute for the process. The subsequent tasting of the wound appears also to be omitted by the latter species.

The number of larvæ which a parasite would attack was not definitely ascertained. After attacking three or four the female Thripoctenus usually died or made its escape. Those that had already oviposited could be counted upon for a repetition of the process more surely than those which had not so far attempted it.

All stages of the thrips except the adult are attacked, the new-hatched larvæ with an alacrity which appears to be ill-judged, as the larvæ of the parasite can hardly develop in them properly, the pupæ with a reluctance which may be well-founded. At least one pupa transformed after a Thripoctenus had oviposited in it.

Development of the Larvæ: The lengths of the egg and larval stages of the parasite were not determined. It seemed impossible to keep the larval thrips alive after removal from the galls, and moreover, individuals oviposited in under laboratory conditions often proved to have been previously infested. The only method of avoiding this source of error was to raise the hosts from the egg, and this could not be managed. Only occasionally were parasite larvæ obtained by dissection. These were extremely delicate in the early stages. One well-grown specimen, dissected from a pupal thrips, resembled the mature forms, being quite smooth, very faintly segmented, and without any pigmentation in the head.

Parasitization was not obvious until it had reached an advanced stage. At this time the host larva grew mottled and waxy in color, the body was much swollen, and the insect was perfectly torpid, if not dead. In a day or two the outlines of the parasites showed beneath its skin. Owing to the large size of the host, successful multiple parasitism is possible, and indeed appears to be the rule. The plate shows a thrips containing three larvæ, and judging from the groups of pupæ found, even more may complete their development in a single host. This is impossible with the smaller hosts of *T. russelli.* The larvæ are always oriented in the same direction, their heads towards that of the thrips. The skin of the latter soon splits and shrivels to a small pad, to which the larvæ remain attached until they pupate. As in the case of *russelli* the contents of the alimentary canal are retained until after the insect has completed its transformation. This substance, bright crimson at first, loses its color shortly before the pupal stage, and is voided by the adult as a milky fluid.

In a few cases the length of the pupal stage was determined. Five larvæ developed from two thrips (three in one, and two in the other) began to darken on August 31. The first three were completely black by next day, the other two twenty-four hours later. On the 11th of September four of the five pupæ (all of the first lot and one of the other) hatched. Two were males and two females. The last pupa, a female, hatched on the 13th.

Adult: Perhaps the most striking difference between *nubipennis* and the Western species consists in the presence of males in the former. *Thripoctenus russelli* was found to be both parthenogenetic and thelytokous, no males being produced through all the generations that were reared. In *nubipennis* the male is not uncommon, though slightly rarer than the female. Copulation was observed on more than one occasion. It is a process of very brief duration.

The sex of the offspring of unfertilized females could not be determined, owing to the aforementioned difficulty in keeping the thrips alive.

The adults ran about actively but were not observed to fly, and seldom jumped. They did not feed when offered syrup, but the females were fairly well supplied with the juices of the thrips. Those that oviposited frequently survived the others, but four or five days was about the maximum length of life under laboratory conditions.

The presence of a member of this genus in the Eastern States is probably of no economic importance, since the thrips upon which it preys are not injurious. They belong to a different suborder from the hosts of the two species of Thripoctenus hitherto described. Whether or not *nubipennis* would attack members of the Terebrantia could not be determined for lack of material, but the great difference in habit renders it unlikely that it would do so under natural conditions.

Acknowledgments.

My thanks are due Professor Brues for aid in classifying the parasites and for suggestions and references of all kinds during the course of the experiment. To Dr. Hood I am indebted not only for the determination of the hosts as mentioned above, but also for information about their life-history and for references on the parasite. Much use has been made of Mr. Russell's bulletin for purposes of comparison.

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Notices not to exceed four lines in length concerning exchanges desired of specimens or entomological literature will be inserted free for subscribers, to be run as long as may be deemed advisable by the editors.

Will exchange insects of various orders for Parasitic Hymenoptera from any part of the world.—C. T. Brues, Bussey Institution, Forest Hills, Mass.

Wanted. Ants from all parts of the world.—W. M. Wheeler, Bussey Institution, Forest Hills, Mass.

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The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's Insects of New Jersey.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

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PSYCHE

VOL. XXIII AUGUST, 1916 No. 4

NOTES ON ANOPLURA AND MALLOPHAGA, FROM MAMMALS, WITH DESCRIPTIONS OF FOUR NEW SPECIES AND A NEW VARIETY OF ANOPLURA.

BY G. F. FERRIS,
Stanford University, California.

Under an arrangement made by the Department of Entomology of Stanford University with Dr. Joseph Grinnell, director of the Museum of Vertebrate Zoölogy of the University of California, the author was enabled to accompany a collecting party from the museum, engaged during the summer of 1915 in a Biological Survey of Yosemite National Park, with the privilege of examining for parasites all the birds and mammals taken by the expedition. In addition, through the kindness of Dr. Grinnell, the author was also permitted to examine the skins in the museum, and it is upon the material obtained in these two ways, that this paper is for the most part based. It is in the nature of a supplement to "The Anoplura and Mallophaga of North American Mammals," by V. L. Kellogg and G. F. Ferris (1915), in which there is a discussion of most of the old species listed in this paper, together with a host list of the Anoplura and Mallophaga from North American mammals.

The examination of museum skins has proven to be an excellent method of collecting Mallophaga and Anoplura, nearly as much material being procured in a few days of such work as could be obtained in an entire summer of field collecting. There is some danger that records obtained in this manner may be unreliable due to the packing together of different hosts, but this danger is really astonishingly small, although cases of this nature were, indeed, met with. Certainly all records based entirely upon the examination of museum skins should be checked up by field only pair I ever took in *cop.* belonged to the two extreme forms. There can be but little doubt that the form *bombylans* mimics *Bombus lapidarius*, while the form *plumata* mimics *Bombus terrestris*. It is only natural that with such a remarkable dimorphic species pairing indiscriminately, and mimicking a genus such as *Bombus* in which there are numerous other color forms, various other color variations should frequently occur, and a vast number of these have been described as distinct species or have received varietal names.

"If it be once recognized that all the European species which are densely pilose belong to one species, concerning which I hold no possible doubt, then the synonymical list in this book will answer for itself, though I may add that I possess several specimens of the North American *V. fascialis* Will. and I cannot distinguish any structural distinction, so that I expect both *V. facialis* Will. and *V. evecta* Walker are also synonymous."

Verrall further states: "A remarkable instance of this mimicry occurs in one very common species, *V. bombylans*, which (I estimate without accurate observation) imitates *Bombus terrestris* (and its allies) for about 60 per cent., but imitates *B. lapadarius* for about 38 per cent., while the other 2 per cent. may be of almost any *Bombus* coloring."

Another interesting feature in connection with this matter is that the inquiline bee *Psithyrus rupestris* so closely resembles *Bombus lapidarius* as to be scarcely distinguishable while *P. vestialis* is banded similar to *B. terrestris*. In this country our species of *Psithyrus* closely resembles our species of *Bombus* and no species resembling *P. rupestris* is found here.

From the above we might infer that the typical *V. bombylans* is absent in America because there is no bumble-bee here like the *Bombus lapidarius* of Europe. On the other hand our forms resemble more closely the various species of *Bombus* found here than the European species do. Thus we have forms with segments three to five of the abdomen with entirely black pile, resembling *Bombus pennsylvanicus*, etc., and others with a fulvous band on the third segment resembling *Bombus ternarius*.

Regarding their habits Verrall says: "Probably all the European species of this subfamily are scavengers in the nests of large aculeate Hymenoptera, feeding on the diseased pupæ, etc., but not parasitic on the living larvæ or pupæ, so that the association is friendly and consequently not resented by the more powerful Hymenoptera; beyond this the scavengers have probably gradually mimicked their hosts in order to obtain the protection afforded by their aculeate powers. Dr. Sharp's observations on the larvæ of *V. inanis*, which live in the nests of *Vespa crabro*, tend to show that the larvæ are welcome scavengers who live on the pupæ which have recently died and who thereby prevent those dead pupæ from contaminating the nest, for which friendly action their imitative coloring may possibly indicate them as friends rather than conceal them as enemies."

Twenty-one specific names are placed in the synonomy by Verrall and twenty-four (including the American *V. evecta*, *sanguinea* and *facialis*) are in the synonomy under *V. bombylans* in the Katalog der paläarktischen Dipteren, 1907.

I have before me seventeen specimens of the European and Asiatic forms and forty-one specimens of the American forms. Specimens from Knight Valley, Cal. (H. Edwards), described as *fascialis* Will. cannot be separated satisfactorily from the European forms, *plumata* and *hæmorrhoidalis*. The pile on the pleura is black and the face and front yellow. A male from Alai Mountains, Turkestan, shows the same variation as a specimen from California, the lateral stripe of yellow pile being absent in front of the tranverse suture; the face, however, is black and the antennæ slightly darker in the Asiatic specimen. The color of the antennæ used by Bigot in his table (Ann. Soc. Ent., France, July, 1883, p. 79) seems to be of little value in separating the forms as there are apparently all gradations from reddish brown to brownish black. As the typical *bombylans* is not known in America it is perhaps best at present to use *fascialis* for the American form and treat all the American forms as independent of the European.

There is a form closely resembling *fascialis*, with the dorsum of the thorax black pilose and face yellow, but the pile on the pleura is yellow. It seems to be confined to the northeastern United States and Canada. Before me are specimens from Franconia, N. H. (Mrs. A. T. Slosson), Wales, Me., June 20, 1909, and Lake Aziscoos, Me., July 8, 1916 (C. A. Frost), Red Indian Lake, Newfoundland, July 20, 1906 (Owen Bryant), and Lewisport, Newfoundland, July (L. P. Gratacap). To this form I assign the name *lateralis*. Types in the Boston Society of Natural History, American Museum of Natural History and the author's collection. These two forms resemble *Bombus terrestris moderatus* and *Psithyrus ashtoni*.

Another form has the dorsum of the thorax more or less black pilose with the middle of the third segment of the abdomen reddish, with long reddish pile. As the latter character applies to *sanguinea* Will., I will adopt that name, although there is apparently a slight discrepancy in the color of the pile on the thorax. This form I have only from the Rocky Mountain region, Silver Lake, Utah, July 16; top of Las Vegas Range, 11,000 feet, end of June (T. D. A. Cockerell); top of range between Sapello and Pecos Rivers, about 11,000 feet, August (T. D. A. and W. F. Cockerell); Banff, Alberta, July 17, 1902 (Amer. Mus. Nat. Hist.). The reddish band across the abdomen suggests a resemblance to *Bombus ternarius*, *B. huntii*, *B. melanopygus*, *B. sylvicola*, etc.

Specimens, which have been referred to *V. evecta* Walker, represent two quite distinct forms, the typical *evecta* has the face black, pile on the dorsum of the thorax entirely yellow and the abdomen with a band of yellow pile at the base and another at the tip of the abdomen, pleura yellow pilose. The other form differs in having only a basal band of yellow, the remainder of the abdomen black. To this form I give the name *americana*. Types in the Boston Society of Natural History and the author's collection. It resembles a number of the more characteristic species of American *Bombus*, including *Bombus pennsylvanicus*, *B. affinis*, *B. bimaculatus*, etc., and *Psithyrus laboriosus*.

Typical specimens of *evecta* are in the collection of the Boston Society of Natural History from Franconia, N. H. (Mrs. A. T. Slosson), North Adams, Mass., June 14, and Sharon, Mass., June 13.

The form *americana* is more widely distributed. Monmouth and Orr's Island, Me.; Hanover, N. H.; North Adams, Great Barrington, Mount Tom, and Auburndale, Mass.; Delaware Water Gap and near Newark, N. J., and Folsom, Pa.

The Labrador specimens represent an interesting form and were it not for the great variation and wide distribution of the group, I would describe it as a new species without hesitancy.

As matters are, however, I prefer to consider it a form for which I propose the name *arctica*.

The male is 12 mm. in length, face black with light yellowish pile, pile on vertex dull yellow, antennæ dark brown, aristæ brown. Thorax black with black pile, except the post-alar callosities which are yellow with yellow pile, pleura black with black pile, scutellum yellow, with yellow pile. Abdomen black, the second and third segments largely yellow with only a dorsal line of black, all the pile of the abdomen yellow. Legs black, tarsi dark brown. Clouding on the wings slight.

The female is similar to the male. The pile on the front is yellowish and on the entire thorax (except the post-alar callosities) a dull yellow more or less mixed with black, when viewed from above the appearance is black. The yellow markings on the third segment are much smaller or obsolete and the pile on the entire abdomen noticeably thicker and a darker yellow. This species resembles the species of the *Bombus borealis* group.

One male and nine females. Rama "N. of three line," 1898 (J. D. Sornborger); Rama, 1898, 1899 (A. Stecker and J. D. Sornborger); Nain (J. D. Sornborger); Nain, August 18, 1908 (Owen Bryant). Holotype, allotype and six paratypes in the Museum of Comparative Zoölogy, and two paratypes in the author's collection.

ON SOME TINGIDÆ FROM NEW ENGLAND.

By H. M. Parshley,
Bussey Institution, Harvard University.

In working on the New England Tingidæ I have come across three apparently undescribed forms, which are characterized herewith. The first belongs to the genus *Dictyonota*, not hitherto represented in the American fauna, of which twenty species and one variety are recognized in the Palæarctic region. Some of the species live on the broom and furze, and the naturalization of these plants along our eastern coast may possibly account for the presence of the insect in question, although *D. tricornis* Schrank is not itself recorded as dependent on the plants mentioned.

Members of this genus are easily recognized by their thick, rugose, spinous antennæ.

Dictyonota tricornis Schrank, var. **americana** var. nov.

Head, and disc of pronotum black, nervures brown, membrane between the nervures gray. Legs and body beneath very dark brown, antennæ black. Anteocular processes spinose, slightly curved, strongly divergent, frontal spines slender, convergent, as long as the first antennal segment. Antennal segments of equal thickness, rough and setose. Pronotal hood transverse, with two or three rows of areoles dorsally, not projecting over the head. The three longitudinal pronotal carinæ uniseriate, sub-parallel, extending from the hood to the posterior edge of the angulate process of the pronotum. Disc of pronotum punctate, transversely convex, narrowed anteriorly, lateral expansions with three to four rows of areoles, not produced anteriorly beyond the eyes, somewhat reflexed, concave above. Hemielytra without discal elevations, the costal vein depressed, those bounding the discoidal area sharply raised; costal area as wide as the discoidal, with two slightly irregular rows of areoles; subcostal area with two rows anteriorly, one posteriorly; discoidal area extending nearly to apex of abdomen, with three slightly irregular rows of areoles, its inner border curved. Pleuræ and bucculæ reticulate, the latter open anteriorly and evenly rounded posteriorly; sternal ridges but slightly elevated; rostrum extending a little beyond the metasternum. Orifices absent. Ventral abdominal segments each with an anterior finely shagreened area, behind which are a few curved striæ connecting the posterior angles. Males with two strong copulatory hooks at apex of abdomen. Form oval. Length 3 mm.; width 1.2 mm.

Holotype ♂, Eastport, Me., 15 July, 1909 (C. W. Johnson), in my collection; paratypes, 2 ♂♂, Machias, Me., 26 July, 1906 (C. W. Johnson); Roque Bluff, Me., 15 July, 1907 (J. A. Cushman), in the collection of the Boston Society of Natural History.

This form differs from typical *tricornis* (*crassicornis* Fall.) as follows: in shape it is a little more elongate; the lateral expansions of the thorax are a little wider; the anteocular spines are more divergent; the hood is a little more elevated; the costal area is biseriate at middle; and the bucculæ are evenly rounded posteriorly, in *tricornis* somewhat angulate. As all these characters are somewhat variable, the form may be considered a variety rather than a distinct species. My thanks are due to Mr. O. Heidemann, for his kindness in examining a specimen and pointing out some of the distinctive characters of the form. As the genus is new to the American fauna, I have included generic and specific characters in the description.

Physatocheila plexa Say, not Osb. & Drk.

Long-winged form.—Uniform dull yellowish brown, eyes and fourth segment of antennæ darker. Head with five adpressed spines arranged as follows: two anterior close together and converging, extending forward between the first antennal segments, one median arising behind and extending forward between the anterior spines, and two lateral, arising beneath the margin of the pronotum and extending forward close to the eyes beyond the base of the median spine; anteocular processes stout, incurved; first antennal segment a little longer than the second, both of these but slightly longer than broad, fourth fusiform, nearly as long as the first and second together, third somewhat longer than the front tibiæ, more slender than the others; rostrum moderate and slightly variable in length, extending more or less beyond the middle coxæ, but not beyond the posterior. Disc of pronotum strongly convex, with three low uniseriate carinæ and broad lateral expansions as in the related species; hood a little lower than in *brevirostris* but higher than in *variegata*. Costal area of hemielytra with two almost regular series of areoles; subcostal area with three rows at middle, narrowing to one posteriorly; discoidal area almost straight exteriorly, extending beyond the middle of the hemielytra; hemielytra extending considerably beyond the apex of the abdomen, apical areoles enlarged. Bucculæ large; rostral channel low, widened posteriorly, open behind; tips of wings visible beyond genital segment. Narrow elongate oval. Length ♂ ♀, 3.1–3.2 mm., width 1.1 mm.

Short-winged form.—Disc of pronotum but slightly convex; hemielytra extending but little beyond apex of abdomen, the areas all present but somewhat shortened; wings, if present, not visible beyond genital segment. Broadly oval. Length 3 mm., width 1.1 mm.

Redescribed from specimens taken at Kingston and Providence, R. I., and Truro, N. S.

That this is the form on which Say based his description of *Tingis plexus* (Compl. Writ., Vol. 1, pp. 349–350) is perfectly evident from these quotations: ". . . brownish, more or less tinged with yellow," and ". . . two series [of reticulations] . . . on the lateral margins . . . [of the hemielytra]," statements which apply particularly to this insect, while there is nothing inapplicable in the rest of the description. The characters of *P. variegata* sp. nov. (=*P. plexa* Osborn and Drake, not Say, Ohio Biol. Surv., Vol. 2, 1916, p. 242) are distinctly at variance with Say's description, especially the color, and the reticulation of the costal area. Moreover, if this species had been before him, it is extremely probable that he would have noted the unusual length of the rostrum, as he did in the case of other small Hemiptera.

Physatocheila variegata sp. nov.
(*P. plexa* Osb. & Drk., not Say)

Long-winged form.—Brown, variegated with black and pale cinereous, eyes and fourth antennal segment darker; spines of head pale; disc, reflexed expanded margins, and angulate process of pronotum more or less marked with black, longitudinal carinæ more or less pale on the ends, this feature persisting especially at the posterior ends of the lateral carinæ, and anterior end of the median; costal area of hemielytra with some of the veinlets black, subcostal and discoidal areas pale cinereous at base and apex, the intervening veinlets more or less blackened; legs brown, femora paler at apex; body beneath cinereous brown. Rostrum unusually long, extending beyond the base of the second abdominal segment. Costal area of hemielytra with areoles irregularly arranged in confused rows, averaging three areoles in width. Other characters about as in the preceding. Form rather broad oval. Length 3.4–4 mm., width 1.3–1.5 mm.

Holotype ♂ and allotype, Gowanda, N. Y., 22 August, 1909 (E. P. Van Duzee); paratypes, Gowanda, N. Y., 21 August, 1898 (E. P. V. D.); Salamanca, N. Y., 20 July, 1911 (E. P. V. D.); Berkeley Springs, W. Va., 26 July, 1888; Wellesley, Mass., 19 May, 1891 (A. P. Morse); Portland, Conn., on white pine, 15 May, 1914 (B. H. Walden). Types in collections of Van Duzee, Parshley, Ohio State University, and Boston Society of Natural History.

This species varies in distinctness of markings but never approaches the uniform yellowish brown of the true *plexa* Say, from which it is further distinguished by its longer rostrum and irregularly triseriate costal area. In *P. brevirostris* Osb. & Drk., the rostrum does not extend beyond the middle coxæ, the color is uniform dull brown, and the costal area is regularly triseriate.

Some time ago Mr. C. J. Drake kindly sent me a specimen of this species, determined as *P. plexa* Say, and recently Mr. Van Duzee, learning that I had a new *Physatocheila* under consideration, most generously submitted specimens known to him to be of a new species, which have been of great assistance to me in working out the true status of these forms.

Melanorhopala obscura sp. nov.

Long-winged form.—Dark yellowish brown, tinged with gray, eyes, tips of antennæ, rostrum, and tarsi darker. Head with five long acute spines, three arising from the vertex and extending freely forward between the antennæ, two adpressed, arising from the base of the head and extending forward near the eyes. Antennæ proportionally about as long as in *clavata*, but less distinctly club-shaped, the third segment being only slightly more slender than the fourth and but little, though distinctly, enlarged at apex; fourth about as long as the first, regularly fusiform; the second shorter than the first, very slightly enlarged apically. Pronotum convex, with three longitudinal carinæ and uniseriate lateral expansions which are vertically reflexed. Costal area of hemielytra uniseriate, subcostal biseriate, discoidal not quite reaching middle of hemielytra; costal margins parallel, slightly sinuate near middle. Length 4.8 mm.

Short-winged form.—Pronotum narrower, disc perfectly flat, hemielytra narrowed apically, the costal margins evenly curved. Length about 4.5 mm.

Holotype, long-winged ♂, Beach Bluff, Mass., 21 June, 1915 (Parshley), taken in ocean beach drift; paratype, short-winged ♂, Nahant, Mass., 16 July, 1915 (Parshley), with apices of hemielytra somewhat injured; both in my collection.

Sufficiently distinct from the other species of *Melanorhopala* by reason of its small size, narrow form, and antennal structure. In

M. clavata Stal the third antennal segment is more slender, the fourth conical, in the long-winged form the costal margins are distinctly curved, not parallel, and the discoidal area extends slightly beyond the middle of the hemielytra; in *M. lurida* Stal the third and fourth antennal segments are longer, scarcely clavate; and in *M. uniformis* Stal the antennæ are much shorter.

QUESTIONS OF NOMENCLATURE CONNECTED WITH THE ANT GENUS LASIUS AND ITS SUBGENERA.

By William Morton Wheeler,
Bussey Institution, Harvard University.

There seems to be no end to the nomenclatorial cataclysms precipitated by men who delight in resuscitating and reëditing musty entomological documents that have been unfortunately spared by the tooth of time to plague those among us who wish to see taxonomy rapidly stabilized so that we may be able to give all our attention to more interesting and important matters. Just as we were beginning to flatter ourselves that a few common insect names in universal use for the greater part of a century must at last be immune from the inroads of the resuscitators we are informed by Morice and Durrant[1] that our familiar generic name *Lasius*, which has been borne so long by the common garden ant, probably the most abundant insect of the northern hemisphere, must be consigned to the synonymic limbo and replaced by a new name. The case is so clearly stated by Donisthorpe in his excellent monograph of British ants[2] that I shall quote his account of it. "Fabricius (Syst. Piez., 415, 1804) published a heterotypical genus *Lasius* for the reception of ten species of ants, but this use of the name is invalid since *Lasius* (Type *Apis quadrimaculata* Panz.) had already been used by Jurine for a genus of bees [Erlangen Litteraturzeitg., 1, 164, No. 33, 1801: Nouv. Méth. Hym., 235–238, No. 33, Pf. 4, 33, 11.33. 1807]. Latreille, Gen. Crust.

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[1] The authorship and first publication of the "Jurinean" Genera of Hymenoptera: being a reprint of a long-lost work of Panzer, with a translation into English, and Introduction and Bibliographical and Critical Notes. Trans. Ent. Soc., London, 1914 (1915), pp. 339–436.

[2] British Ants, Their Life History and Classification. Plymouth, Wm. Brendon and Son, Ltd., 1915, p. 186.

Ins. 4.126 (1809) sunk *Lasius* F. as a synonym of *Formica*, and the Fabrician name ceased to be used till 1861, when Mayr (Europ. Formicid., 49, 1861) revived and recharacterized *Lasius* F., adopting *niger* L. as his type. Bingham Faun. Brit. India. Hym. 2, 338 (1903) and Wheeler Ann. New York Acad. Sc., 21, 165 (1911), also cite *niger* as the type. This species was also adopted as the type by Morice and Durrant Trans. Ent. Soc., London, 1914, 9, 421–423 (1915), who gave the following reasons for the change of the name: "In the Systema Piezatorum Fabricius made use of Jurine's name *Lasius* but applied it to a genus of ants which he separated from *Formica* L. and later authors have ignored Jurine's *Lasius*, no doubt because the publication of the Piezatorum (1804) antedates that of the Nouvelle Méthode (1807). But the real date of *Lasius* Jrn. as we now learn, is May 30, 1801 (Erlangen list), § *Lasius* F. (1804) therefore sinks as a homonym of the earlier *Lasius* Jrn. A new name for *Lasius* F. is necessary; there being apparently no existing synonym, we therefore propose that it be called *Donisthorpea* in recognition of Mr. H. St. J. K. Donisthorpe's careful investigations into the bionomics of this and other Heterogynous genera."

A study of Morice and Durrant shows that the article which they unearthed in the Erlangen Litteraturzeitung of 1801 was published anonymously, but that in a footnote to page 7 of the Kritische Revue of 1806 Panzer admitted that he was its author. It is clear, furthermore, that Panzer cited *Lasius* and several other Hymenopterous genera as Jurine's. My friend Professor Cockerell writes me that he regards the Panzer article as having no taxonomic status both because it was published anonymously and because it did not appear in a scientific journal. I incline to agree with him, though I am compelled to admit that the publication of the genera as Jurine's and not as those of the anonymous author may put a different construction on the matter. This evidently determined Morice and Durrant to accept *Lasius* and certain other genera as being valid and as antedating those of Fabricius. So far as I am able to learn, cases of this kind are not specifically provided for in our various nomenclatorial codes.

Accepting for the moment the correctness of Morice and Durrant contention that *Lasius* Jurine must supplant *Anthophora* among the bees and that the genus *Lasius* Fabr. must be renamed, we may next inquire whether the introduction of the name *Donisthorpea* was justified. Little study of the history of the ant genus *Lasius* is needed to establish the fact that there are at least *three* other names, each of which would take precedence of the one suggested by the authors under consideration. In 1840 Shuckard[1] gave the name *Formicina* to a genus, which according to his statement contained what we now call *Formica rufa* and *Lasius flavus*, so that if no resuscitator succeeds in exhuming some other name suggested between 1807 and 1840, *Formicina* should be chosen to replace *Lasius* Fabr., with *L. flavus* as the type. Shuckard evidently selected the large *Formica herculeana* L. as the type of his genus *Formica* (our present *Camponotus*) and placed the smaller species, which we now assign to *Formica* and *Lasius*, in his genus *Formicina*. A second name *Acanthomyops*, was proposed by Mayr in 1862[2] for the North American *Lasius claviger* Roger. This name has since been retained as that of a subgenus characterized by three-jointed instead of six-jointed maxillary palpi in the worker and female. Ruzsky,[3] in 1913, recognized two additional subgenera: *Dendrolasius* and *Chthonolasius*, the type of the former being *L. fuliginosus* Latr.; that of the latter, *L. flavus* L. *Chthonolasius*, therefore, falls as a synonym of *Formicina* Shuckard, but even *Dendrolasius* would take precedence of *Donisthorpea*. If, however, *Formicina* takes the place of *Lasius* as a generic name, the genotype must be shifted to *L. flavus*, a species belonging to what is now a different subgenus, so that *Donisthorpea* could be retained as the name of a subgenus with *L. niger* as the type. The genus would then have the following composition:

Genus *Formicina* Shuckard (=*Lasius* Fabr.).
  Genotype: *Formica flava* L.
Subgenus *Formicina* Shuckard (=*Chthonolasius* Ruzsky).
  Subgenotype: same as the genotype.
Subgenus *Donisthorpea* Morice and Durrant (=*Lasius auct*).
  Subgenotype: *Formica nigra* L.
Subgenus *Dendrolasius* Ruzsky.
  Subgenotype: *Formica fuliginosa* Latreille.

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[1] In Swainson and Shuckard's "On the History and Natural Arrangements of Insects," Longman, Orme, etc., London, 1840.

[2] Verh. zool. bot. Ges. Wien, 12, 1862, p. 699.

[3] Myrmekologische Notizen. Arch. f. Naturg., 79, 1913, pp. 58–63, 3 figs.

Subgenus *Acanthomyops* Mayr.
Subgenotype: *Lasius claviger* Roger.

While discussing Morice and Durrant's work in a recent paper[1] Forel contends that *Acanthomyops* Mayr. should replace *Lasius* Fabr. He therefore cites the genus and its subgenera thus:

"Genre *Acanthomyops* Mayr. (1862).
=*Lasius* F. 1804 (*non* Jurine 1801).
=*Donisthorpea* Morice et Durrant.
Type: *claviger* Roger.
Subgen.: *Chthonolasius* Ruzsky.
Type: *niger* L. (*flavus* ex Ruzsky).
Subgen.: *Dendrolasius* Ruzsky.
Type: *fuliginosus* Latr."

This arrangement seems to me to be inadmissible, first, because Forel has no right to change the type of the subgenus *Chthonolasius* from L. *flavus* to L. *niger*, and second, because these two forms, in my opinion, represent distinct subgenera, *Chthonolasius* (=*Formicina*) being sufficiently characterized by the shape of the maxillary palpi of the female and worker, the vestigial eyes of the worker and the hypogæic mode of life. In the two latter characters the species of *Chthonolasius* resemble those of *Acanthomyops* and not *niger* and its allies. As an after-thought, however, Forel appends the following postscript: "Mr. Emery m'écrit qu'à son avis il vaudrait mieux prendre pour *Lasius* le nom nouvellement deterré par Wheeler de *Formicina* Shuck., nom en partie basé sur le *Lasius flavus*. Je n'ai rien à y opposer, pourvu qu'on finisse une bonne fois avec ces déménagements perpétuels des anciens noms." I infer, therefore, that he now favors an arrangement like that given above (p. 170) with *Formicina*as the genus, but with *Donisthorpea* eliminated and its species included in the subgenus *Formicina*.

For the present I propose to be conservative and to retain *Lasius* Fabr., because the status of Panzer's Erlangen list seems to me to be very dubious and because I sympathize with those entomologists who decline to abolish generic names in universal use for more than half a century. I therefore suggest the following as a satisfactory arrangement of our North American forms of *Lasius*:[1]

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[1] Fourmis du Cogo et d'autres provenances récoltées par M M. Hermann Kohl, Luja, Mayne, etc. Rev. Suisse Zool. 24, 1916. p. 460.

Genus *Lasius* Fabr.

Subgenus *Lasius* Fabr. (=*Donisthorpea* Morice and Durrant)
niger L. var. *sitkaënsis* Pergande.
  Var. *neoniger* Emery.
  Subsp. *alienus* Forster var. *americanus* Emery.

Subgenus *Formicina* Shuckard (=*Chthonolasius* Ruzsky).
flavus L., subsp. *nearcticus* Wheeler.
  Subsp. *claripennis* Wheeler (in MS.).
brevicornis Emery.
  Subsp. *microps* Wheeler (in MS.).
umbratus Nylander subsp. *subumbratus* Viereck.
  Subsp. *mixtus* Nyl. var. *aphidicola* Walsh.
  Subsp. *vestitus* Wheeler.
  Subsp. *speculiventris* Emery.
  Subsp. *minutus* Emery.
humilis Wheeler (in MS.)

Subgenus Acanthomyops Mayr.
claviger Roger.
  Subsp. *subglaber* Emery.
interjectus Mayr.
  Subsp. *mexicanus* Wheeler.
  Subsp. *coloradensis* Wheeler (in MS.).
  Subsp. *arizonicus* Wheeler (in MS.).
  Subsp. *californicus* Wheeler (in MS.).
occidentalis Wheeler.
murphyi Forel.
latipes Walsh.

POSTSCRIPT.

Since the preceding article was sent to the Editor of PSYCHE, I have received from Professor Emery a paper (Formiche d'Italia nuove o critiche. Rend. R. Accad. Sc. Ist. Bologna 12 Marzo,

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[1] The subgenus *Dendrolasius*, which should include besides the subgenotype L. *fuliginosus*, the peculiar Japanese L. *spathepus* Wheeler, is confined to Eurasia and is therefore omitted.

1916, pp. 53–66, 7 figs.) in which he discusses the synonymy of *Lasius* and its subgenera. He accepts Jurine's *Lasius* as valid and substitutes *Formicina* Shuckard for *Lasius* Fabricius, presenting the same arrangement of the subgenera and their types as I have given on page 170. I am still unable to take this view of the matter, because I am not convinced that the generic name of another author (in this case Jurine) is valid when cited in an anonymous paper which itself has no taxonomic status. It would seem that if an anonymous author later acknowledges the authorship of his paper, the validity of the latter should date only from the time of this acknowledgment. If this rule were followed, *Lasius* Jurine would date from 1806 and could not replace *Lasius* Fabricius of 1804.

A PHOSPHORESCENT ANT.

By William Morton Wheeler,
Bussey Institution, Harvard University.

Mr. George P. Engelhardt, curator of the Division of Invertebrates of the Brooklyn Museum, recently sent me the following letter and the ant to which it refers:

"San Francisco, Calif., Aug. 8, 1916.

"*My dear Prof. Wheeler:*

"One of my most interesting days on the Pacific Coast this summer was spent with Fordyce Grinnell on a thirty-mile tramp through the Sierra Madre, July 28. Starting from Pasadena we followed the Arroyo Seco to the Divide, came up around Mount Gabriel (6,150 feet) and reached Mount Lowe (5,650 feet) in time for a glorious sunset. Our descent from Mount Lowe was made over the steep and winding ridge trail after dark. There was no moon, but a star-studded sky, while 5,000 feet below Pasadena and Los Angeles had been transformed into a sea of sparkling lights.

"Down at about the 4,000 feet level we stopped before a bright spark rapidly crossing the trail. Expecting to find one of the Lampyrids, or fireflies, which Grinnell told me were uncommon in the region, we struck a match and to our surprise found an ant. Neither of us had heard of phosphorescent ants before. In a cyanide tube the phosphorescence of the ant remained undiminished for fully five minutes, after which it decreased gradually and in fifteen minutes disappeared. The light issued ventrally from the last two or perhaps three abdominal segments. It was greenish yellow, and very much like that of our common eastern firefly, only it was constant, not intermittent

"We kept a sharp look-out all the way down the trail, but no other specimens were found.

"Very sincerely yours,
"GEO. P. ENGELHARDT."

The ant proves to be a worker media of *Camponotus maculatus* Fabr., subsp. *vicinus* Mayr., var. *semitestaceus* Emery, a form peculiar to higher elevations in the Californian Coast Range. It is the palest of several varieties of *vicinus*, which ranges as far east as Colorado and Montana and as far south as Arizona and New Mexico. The yellow color of the var. *semitestaceus* shows that it is nocturnal, but my observations lead me to suspect that the darker forms of *vicinus* have the same habit. As no ants are known to possess photogenetic organs, and as *C. maculatus* is of world-wide distribution and represented by many yellow subspecies and varieties especially in North Africa and Asia Minor, where any tendency to phosphorescence would certainly have been seen and noted, I conclude that the specimen taken by Mr. Engelhardt must either have just fed on some phosphorescent organism or have been infected with phosphorescent bacteria. Although Dr. Rudolph Glaser went to some pains to section and stain the hard abdomen of the specimen for me, I was unable to detect any structures that might account for the luminescence. This failure was in great part due, in all probability, to the imperfect preservation of the ant, which had merely been dropped into strong alcohol. The problem of the source of the greenish yellow light emitted by the posterior abdominal segments and witnessed by Messrs. Engelhardt and Grinnell will, therefore, require fresh material for its solution and must be referred to some entomologist residing in California.

A NEW SPECIES OF APHIOCHÆTA (DIPTERA, PHORIDÆ) FROM NEW ENGLAND.

By Charles T. Brues,
Bussey Institution, Harvard University.

Aphiochæta johnsoni sp. nov.

Length, 2.0 mm. Fore tarsi thickened; mesopleura bristly above, without any macrochæta, two scutellar bristles. Thorax brownish yellow; head black; abdomen black or piceous, the first three segments narrowly margined with whitish; hypopygium fuscous, its lamella yellow; legs luteous or dull yellow. Front slightly broader than high; ocellar tubercle large, median frontal groove present, proclinate bristles four, the lower pair much more delicate than the upper pair and almost as far apart; inner bristle of lower reclinate row on the anterior margin of the front midway between the upper proclinate one and the eye-margin, outer bristle close to the eye-margin and well above the margin of the front; middle row of four equidistant bristles forming a row that is bent down medially. Antennæ not enlarged, dark fuscous, arista as long as the head height, strongly pubescent. Palpi distinctly enlarged, but less so than in *A. projecta,* with several short bristles below and a pair at tip almost as long as the vertical thickness of the palpus; cheeks each with two strong bristles; postocular cilia strong. Propleura above the coxa with stout bristles and with weaker ones on its upper half. Mesonotum subshining, hairy, with a number of bristles along the sides and posterior edge; scutellum with two bristles and two hairs; mesopleura above with a patch of small bristles of equal size. Abdomen opaque, with scattered bristly hairs, especially conspicuous near the sides of the basal segments and on the disc of the fourth and following segments. Hypopygium and its median lamella also bristly. Legs stout; anterior tarsi thickened, longer than their tibiæ; middle tibiæ with very weak cilia; those of hind tibiæ a trifle stronger, but not conspicuous; hind tibiæ with four short transverse rows of minute bristles inwardly at tip; hind tibiæ not ciliate below, with only the usual short hairs. Wings large, distinctly tinged with brownish; costal vein extending to distinctly beyond the middle of the wing; costal cilia short and closely placed; first section of costa slightly more than twice as long as the second; third three-fourths as long as the second; second vein ascending rather sharply to the costa; fourth vein curved at the base, but nearly straight beyond, fifth and sixth sinuous; seventh distinct, long. Halteres pale yellow.

One specimen from Kent, Me., August 19, collected by Mr. C. W. Johnson. Type in the collection of the Boston Society of Natural History.

This species is related to *projecta* Becker which also occurs generally through New England (Boston, Mass.; Brookline, Mass.; Hanover, N. H.), but differs by having the lower pair of proclinate bristles weaker and the palpi less noticeably enlarged in the male as well as by the absence of a fringe of hairs on the posterior femora and the presence of only two scutellar bristles. It is also much like the European *A. hortensis* Wood, but the hypopygium is bristly.

THE PANURGINE BEES OF THE GENERA HESPERAPIS, ZACESTA AND PANURGOMIA.

By T. D. A. Cockerell,
University of Colorado, Boulder, Colorado.

The genus *Hesperapis* Ckll., 1898, was based on *H. elegantula* Ckll. from New Mexico. At the present time seven species are assigned to it, the range of the genus being from New Mexico to Southern California. The following table separates the known forms:

Thorax above with moss-like ochraceous hair; abdomen dull ferruginous................................*elegantula* Ckll.

Thorax with ordinary pubescence; abdomen not red 1

1. Area of metathorax dull, or only the apical part shining......2

   Area of metathorax polished and shining....................3

2. Mesothorax strongly and closely punctured, somewhat shining; male about 11.5 mm. long..............*eumorpha* (Ckll.)

   Mesothorax and scutellum shining, polished, finely punctured; male a little over 6 mm. long..............*nitidula* Ckll.

   Mesothorax and scutellum dull, not evidently punctured *semirudis* Ckll.

3. Wings perfectly clear........................... *larreæ* Ckll.
Wings brownish.. 4
4. Wings milky at apex; legs of male wholly black ..... *oliviæ* Ckll.
Wings not milky at apex; male tarsi variably reddish
rhodocerata Ckll.

The description of ♀ *rhodocerata*, as originally given (*Panurgus rhodoceratus*, Trans. Am. Ent. Soc., XXIV, p. 148), included the ♀ of *H. oliviæ*, which is separable with difficulty. The males are more distinct and the ♂ *rhodocerata* may be regarded as the type. Both species visit the flowers of *Pectis* in September.

Zacesta Ashmead, 1899, was described as a member of the Osmiinæ, but Titus (Jn. N. Y. Ent. Soc., XII, p. 26) showed that it was a Panurgid. It comes from Los Angeles County, Cal., and is known only in the male. Examining the type of *Z. rufipes* Ashm. in the U. S. National Museum, I found that it closely resembled *Hesperapis* as typified by *H. elegantula*. The following characters are noteworthy:

(1) The moss-like ochraceous hair on thorax above, as in typical *Hesperapis*.
(2) The narrow face and essentially parallel orbits, as in *H. elegantula*.
(3) The orange flagellum, as in *H. elegantula*, but the scape shorter and stouter (sexual character?).
(4) Clypeus has a broad yellow apical band, not seen in *Hesperapis* (but male of *H. elegantula* is unknown).
(5) Compared with *H. elegantula* has larger, shining, area at base of metathorax.
(6) Venation is as in *H. elegantula*, except that second submarginal cell is longer, and the lower section of basal nervure descends much less abruptly.
(7) The pygidial plate is long and narrow.
(8) Titus has described the palpi of *Zacesta;* the first three joints of labial palpi are nearly equal whereas in *H. elegantula* the first is nearly as long as 3 plus 4, the second somewhat shorter than the first.

Hesperapis, as interpreted above consists of at least two very distinct groups, one typified by *H. elegantula* (type of genus), and the other containing the remaining species. *Zacesta* is perhaps closer to *H. elegantula* than it is to the other species assigned to *Hesperapis*, and its rank as a genus appears doubtful. I think we must call it *Hesperapis* (*Zacesta*) *rufipes* (Ashm.).

Panurgomia Viereck, 1909, was based on *P. fuchsi* Viereck, from Arizona. The unique specimen, a female, was unfortunately in bad condition. Mr. J. C. Crawford recently wrote me (February, 1916) that he considered the genus identical with *Hesperapis*, and the type species at least extremely close to *H. eumorpha* Ckll. This led me to reëxamine the type, and I found that it possessed the essential characters, so far as could be seen, of the group of *Hesperapis* which includes the majority of the species. The entirely dull area of metathorax agrees with the minor group of *H. eumorpha*, etc. The stigma is too large for typical *Hesperapis*. The clypeus is large, strongly convex, polished and shining. Hence it appears that *Panurgomia* is a valid subgenus (or genus?) for the group of *Hesperapis* which excludes the typical species.

A NEW ENGLAND ORTHOPTERAN ADVENTIVE.

By Albert P. Morse,
Wellesley College, Wellesley, Massachusetts.

Hapithus vagus sp. nov.

A large and rather stout member of the genus. Rostrum of the vertex as broad as the basal joint of the antennæ. Antennæ, except the basal joint, long and extremely slender, two or three times as long as the body, pale brown, annulate with dusky on alternate joints, every third annulus darker; this pattern is very noticeable near the base and becomes indistinct apically. Maxillary palpi with last joint slender at base, a little securiform, twice as long as the width of the broadened tip.

Pronotum transverse, narrowed anteriorly, the front margin straight or slightly concave, the hind margin a little convex medially; lateral lobes twice as long as deep, smoothly convex below, the anterior and posterior angles rounded. Tegmina nearly or quite covering the abdomen, those of male flat above; of female a little convex, with densely and irregularly reticulate venation, the lateral field crossed by about seven parallel oblique branches of the mediastinal vein. Wings as long as tegmina. Hind femora plump, stout, a little less than three times as long as broad. Hind tibiæ armed with four spines on outer side, usually five (sometimes six) on inner side, with numerous short rigid teeth between them. Ovipositor slightly shorter than the hind femora, straight or gently curved upward at base, the tip armed at base with a prominent, dull tooth which is succeeded by a diminishing series of four or five smaller ones toward the apex. Cerci short, less than one-third as long as ovipositor, tapering acuminately from a stout base to a delicate point and clothed with long, soft pubescence.

The ground color is a pale yellowish brown thickly and irregularly spotted and in places washed with darker brown and fuscous, particularly in an hour-glass or X-shaped mark on the middle of the pronotum above, the entire area of the lateral lobes, the dorsal part of the lateral field of the tegmina, and the outer face of the hind femora. The dorsal field of the tegmina of the female often shows a series of three or four oblique dusky lines running backward and inward from the canthus along irregular raised venules; in the male a variable number of irregular fuscous spots is distributed chiefly along the canthus and about the speculum, with a larger stigmatal blotch.

MEASUREMENTS.

Body.	Hind fem.		Tegmina.	Antenna.	Cercus.	Ovipositor.
	Length.	Width.				
♂ 13–15 mm.	10	3.5–4	9.5–10	40–45	2.5	
♀ 14–15 mm.	10–12	3.5–4.5	9.5–10	40–45	2.5	8.5–9 mm.

Described from the type (♀), allotype (♂), and several paratypes of both sexes; the material also contains several nymphs in various stages. Collection of A. P. Morse.

This species was first recorded by Scudder (PSYCHE, September, 1900, 105) under the name *Apithes agitator*, from the greenhouse of the Botanic Garden at Cambridge, Mass. The specimens on which the description is based were collected there in alcohol in September and October, 1902. Recently, on pinning them up, it was seen to be quite distinct from *agitator*. Mr. Morgan Hebard has kindly examined a pair and compared descriptions and regards it as new.

I am informed by Mr. Cameron of the Botanic Garden that these insects were troublesome in the greenhouse for five or six years, eating the tender green leaves of many kinds of plants and seeming to be particularly fond of ferns; also, that they were believed to have come originally from Jamaica. Their extermination is believed to have been effected at least in part through the introduction into the greenhouse of a number of small frogs.

ANTS CARRIED IN A FLOATING LOG FROM THE BRAZILIAN MAINLAND TO SAN SEBASTIAN ISLAND.

By William Morton Wheeler,
Bussey Institution, Harvard University.

Dr. Hermann von Ihering, the well-known writer on zoögeography and till recently the director of the Museu Paulista of San Paulo, Brazil, has sent me for identification some ants which were taken under the peculiar circumstances described in the following paragraph quoted from his letter:

"I find that the 'raft-theory' of dispersal has generalized some exact observations in an extraordinary manner. Here in South America we have wonderful opportunities to observe the 'swimming islands' in the great rivers, although the upper and lower courses of these streams have to a considerable extent their own peculiar faunas. My experiments with wood, bamboo, etc., containing ant-colonies, have demonstrated that the latter are decidedly resistant to submersion provided their nest-entrances are closed. Till the current year, one of our naturalists, Mr. Gaste, was, however, unsuccessful in his various excursions in finding living insects in wood that had drifted from our coast. One morning, while he was on the island of San Sebastian, he found a tree trunk that had floated to the shore during the night and was filled with a living ant-colony belonging to a species of *Pheidole* unknown to me. San Sebastian is situated some kilometers off the coast of the main land. Of course, we cannot say how long this log had been floating in the water before it reached the island. Please examine the ants," etc.

The portion of the ant-colony received from Dr. von Ihering consists of a single soldier, five workers and three young, winged females, representing a new species of *Pheidole* of which I subjoin a description.

Pheidole peregrina sp. nov.

Soldier: Length, 3.2 mm. Allied to *Ph. pubiventris* Mayr, *rufipilis* Forel, and *angusta* Forel, especially to the last. Head small, subrectangular, a little longer than broad, as broad in front as behind, with rather straight sides and feebly excised posterior margin. Eyes moderately large and convex, in front of the middle of the sides of the head. Mandibles rather large, indistinctly denticulate in the middle, with two large apical and two small basal teeth. Clypeus with a short carina behind, concave in front, with rather deeply notched anterior border. Frontal area distinct, triangular, not deeply impressed, with median carinula. Frontal carinæ short. Antennal scapes rather stout but not flattened, curved at their bases, their tips reaching a little more than half the distance between the eyes and the posterior corners of the head. Joints 2–7 of the funiculus scarcely longer than broad, club a little longer than the remainder of the funiculus, its two basal joints subequal, together as long as the terminal joint. Thorax shaped much as in *pubiventris*, but the pronotum without prominent humeral tubercles and the epinotal spines reduced to small, erect teeth which are not longer than broad at their bases. Petiolar node compressed anteroposteriorly, with indistinctly emarginate, transverse superior border. Postpetiole less than twice as broad as the petiole, with rounded sides and dorsal surface. Gaster elongate elliptical, with distinctly truncated anterior border. Legs moderately long.

Smooth and shining: mandibles coarsely and sparsely punctate; cheeks and front rather loosely longitudinally rugose; remainder of head with sparse, fine, piligerous punctures. Mesonotum, epinotum and sides of petiole opaque, very finely and obscurely punctate-rugulose.

Hairs short, abundant, pale yellow, reclinate, covering the whole body and the appendages, longest on the gaster, which, however, has no appressed hairs. Pubescence absent.

Brownish yellow, legs a little paler, clypeus and posterior portion of gaster somewhat darker; antennal clubs blackish.

Worker: Length, 2 mm. Head distinctly longer than broad, narrower behind than in front, without posterior corners but with distinct, reflected occipital margin. Eyes in front of the middle of the sides. Mandibles finely denticulate, with two larger apical teeth. Anterior clypeal border straight, transverse and entire in the middle. Antennal scapes extending about one-fourth their length beyond the occipital border of the head. Thorax, petiole, postpetiole and gaster much as in the soldier, but epinotal teeth more slender and pointed and a little longer than broad at their bases.

Sculpture and pilosity as in the soldier but the hairs are somewhat more erect.

Brownish yellow, mandibles paler, head, clypeus and terminal antennal joint castaneous. In some specimens the middle portions of the femora and tibiæ are very feebly infuscated.

Female: Length, 5–5.5 mm. Head distinctly broader than long, a little broader behind than in front, with straight sides and feebly excavated posterior border. Mandibles finely denticulate, with two large apical teeth. Clypeus as in the soldier. Antennal scapes reaching to the posterior corners of the head. Thorax of the usual shape, with strongly flattened mesonotum; epinotum with acute teeth as long as broad at their bases. Petiolar node rather low, its upper border sharp and entire.

Sculpture, pilosity and color much as in the soldier, but the head indistinctly rugulose and coarsely punctate over its whole dorsal surface, the mesonotum more densely punctate and behind on the middle finely and densely striolate, the postpetiole opaque and finely punctate and the gaster brown, except at the base. Ocellar region black. Wings yellowish hyaline, with pale yellow veins and pterostigma.

This species differs from *pubiventris*, *rufipilis* and *angusta* in its smaller size, in pilosity and in the head of the soldier being even smaller than in *angusta*. The hairs of *peregrina* are more reclinate, more abundant and shorter than in any of these species, the epinotal spines are less developed, the pronotum is smooth and rounded, without tubercular humeri in the soldier and the head of the worker is longer and has a reflected occipital margin which is lacking in *pubiventris* and *angusta*.

The observations of Mr. Gaste and Dr. von Ihering throw light on one of the methods of ant dispersal. Of course, the establishment of a species of ant on an island does not require the conveyance of a whole colony as in this instance, since a single fecundated female enclosed in a vegetable cavity might, if transported in a similar manner, suffice for the establishment of a species.

ON THE TYMPANUM OF CERTAIN LEPIDOPTERA.

By William T. M. Forbes,
Ithaca, N. Y.

At the base of the abdomen in many Lepidoptera there is a curious and complex organ, which has been referred to but rarely in the literature, and which is known, in the Geometridæ, at least, as the tympanum. So far as I have discovered, its function is unknown, but its location and general structure justify the guess that it is the resonator for an auditory organ, corresponding to the well-known one in the Hemiptera. It should prove an interesting problem for the histologist and physiologist. The present article will not consider its function, but will outline its structure in the principal families of Macrolepidoptera, and offer a couple of suggestions as to their relationship.

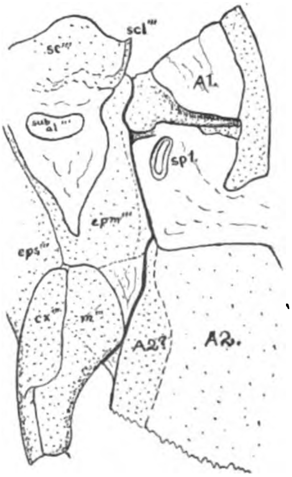

Fig. 1. Side view of metathorax and base of abdomen of *Apatelodes torrefacta* (Euypterotidæ), showing primitive macrolepidopterous arrangement of sclerities.

A brief examination shows that there are several analogous, but not homologous organs of this type in the various families, indicating parallel lines of descent from a form that presumably had neither, but may have possessed a wholly internal sense-organ,—which served as a stimulus to their formation,—in connection with the first spiracle. The first type of tympanum is that more or less familiar in the Geometridæ, which is used by Prout (Genera Insectorum, fasc. 103) as the most fundamental distinguishing character of that family. This appears superficially as a simple hollow balloon located immediately below the spiracle, opening to the exterior in the fold that normally exists in the sclerite of the abdomen facing the hind coxa. It is usually more or less ellipsoidal, and opens conspicuously on the side, forward and outward. In many cases the two tympana are so large as to be separated from each other only by membrane, and look like a pinhole clear through the moth,—as is very conspicuous in Eudule and many Acidaliinæ (Sterrhidæ). In the Ennominæ the organ is smaller and less conspicuous externally, but entirely of the same character, and it exists even in the lower Œnochrominæ (Monocteniidæ). In this type the spiracle lies on the upper edge of the organ, and the dorsal part of the segment is normal.

Internally (Fig. 6) the structure is seen to be somewhat more complex. The tympanum itself may be compared roughly to a kettle-drum with edges curving inward strongly to meet the edge of the membranous area that represents the head, and faces forward. (It has been turned back in the figure to show the structures between it and the thorax.) Running almost across this head there is a tapering chitinous tongue, lying in the membrane, to the tip of which are attached a couple of muscles, the soft fleshy connection with the nerve (B), which histological study, is likely to prove the end-organ itself, and a variety of air-sacs and fine tracheæ. In fact the whole organ is enveloped in a system of air-sacs, which have mostly been removed in the specimen figured. The external opening of the apparatus is on the side that lies against the body-wall,—as if a large hole had been cut in the side of the kettle. The nerve-supply appears to be from the anterior segmental nerve of the first segment of the abdomen, which runs back from the ganglion, which is fused with the metathoracic one. This nerve runs past the tympanum anteriorly, and then over the spiracle and up to supply the dorsal musculature, etc. The part of it between the tympanum and spiracle is surrounded by large air-sacs, which connect directly with the spiracle.

The European genus *Cimelia* is generally placed in the Geomet-

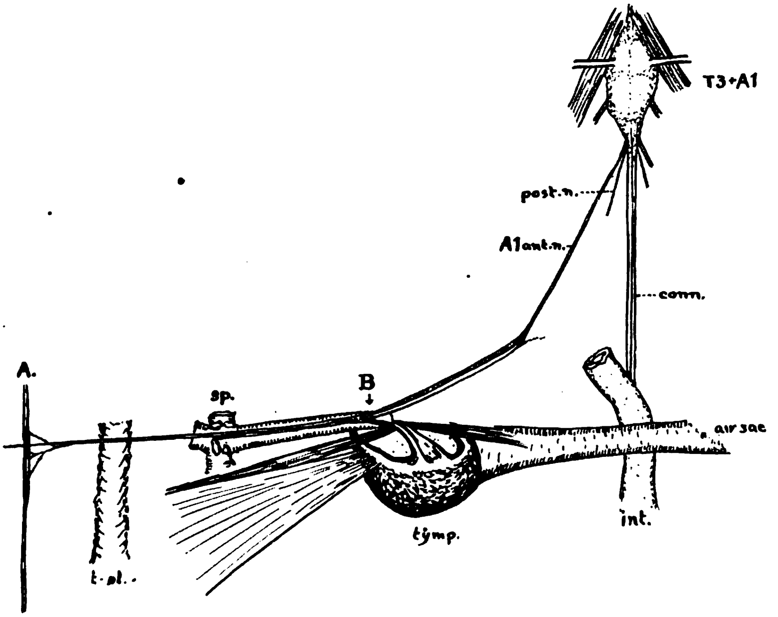

Fig. 6. Tympanum with its principal muscles and nerve connections, of the Geometridæ (drawn from *Biston ursaria* and *Phigalia titea*). Only two of the numerous air-sacs are indicated, the one lying ventrad of the nerve, and along which the nerve runs from the tympanum to the spiracle, and the large double one connecting the tympana. The latter appears ventral in the dissection, which was opened out on the middorsal line, but in fact lies above the digestive system. When the dissection is first opened it is normally filled with air and may be the most conspicuous object in the field.

ridæ, but appears to be omitted in Prout's consideration of the Œnochrominæ (Genera Insectorum, fasc. 104). A superficial study of the single dry specimen available shows that there is no true tympanum, either of Geometrid or any other type, but there is a slight thickened bar that may represent the bar across the drum-head of the tympanum, lying in the membrane of the ventral surface. There is no definite suggestion of Notodontid structure; and I believe that the genus represents a new family type, leading up to the Geometridæ from something intermediate between the Dioptidæ and Notodontidæ,—probably direct from the unknown Geometrid-Bombycid ancestral form. There seems to be nothing in venation or mouth-parts to contradict this reference.

For the normal, and primitive condition in the Lepidoptera (except the very lowest Tineoids and Jugatæ), we may take Apatelodes, a somewhat isolated genus of the Bombycid stem (Fig. 1). Here the metathorax is moderately developed, and there are no specializations which do not occur all the way from the Cossidæ to the Saturniidæ. The scutum and scutellum are normal, the cord connecting the scutellum with the inner margin of the wing is somewhat wavy, but forms no distinct lobe, the epimeron is V-shaped as in the mesothorax, and though too lightly chitinized to be quite sure of its boundaries shows no sculpturing except a slight articular surface where it meets the tergopleural line of the abdomen. The postscutellum is not sharply set off from it, and the entire structure is essentially as in the mesothorax. The first segment of the abdomen is, as usual in Lepidoptera and related insects, largely membranous; the tergum is a rectangle of membrane, enclosed in an anterior band which articulates subdorsally with the thorax, a posterior band, extended well down on the sides, but not reaching the ventral region, and a pair of heavily chitinized lateral grooves;—the latter seem to represent the tergopleural suture, so that the narrow edge of chitin below them should be considered the pleurite. The front end of this groove runs to a shallow pocket between thorax and abdomen. The lateral region is wholly membrane, containing a normal spiracle. Ventrally the first two segments are not distinguished, and are heavily chitinized only in front where they lie against, and are slightly grooved by, the posterior coxæ. The external modification to form the first or Geometrid tympanum is merely the enlargement of the coxal groove into an ample cavity, and the distortion of other structures to make room for it.

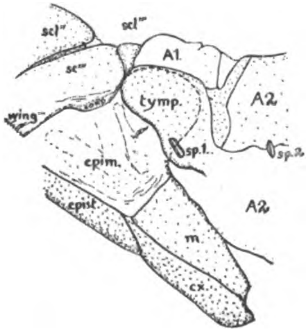

Fig. 2. Same view of *Hemerocampa leucostigma* (Liparidæ), showing second type of tympanum.

The second type of tympanum occurs in the Arctiidæ, Lymantriidæ, Syntomidæ, Pericopidæ, etc. (Fig. 2.) In this the thorax is undisturbed, though in the forms I have studied there is the usual lack of definiteness of the epimeron; the abdomen dorsally and ventrally is as before, but in the pleural region above the spiracle there has developed a bulla exactly like that of the Geometridæ externally, but instantly distinguished from it by the fact the spiracle lies on its lower edge. A cursory examination suggests that it has developed out of the remaining rudiments of pleurites. The thorax shows more or less trace of the curious modification described for the Noctuidæ, but the venter of the abdomen is typical.

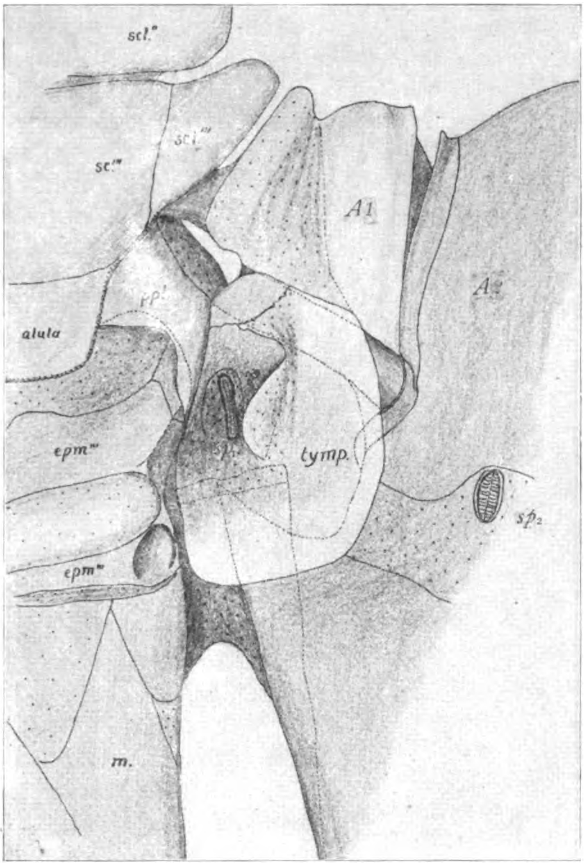

Fig. 3. Same view of *Catocala parta*, showing third, or usual Noctuid type of tympanum. The cover, or alula of the hind wing is drawn forward, and the posterior edge is turned back to expose the spiracle and structures within the tympanum.

The third, or Noctuid type, is perhaps the most interesting of all, being at once the most complex, and that occurring in the largest family. (Fig. 3.) Here there is no simple rounded bulla, either subdorsal or subventral, but the whole spiracular region is deeply excavated, the excavation including the posterior region of the thorax as well. This cavity in the more typical case is roofed over by the alula of the hind wing, which is largely developed, especially in such Quadrifidæ as Catocala and the Euteliinæ, and is enclosed behind by a large flap, developed behind the spiracle. It seems to be the same pleurite that has formed this and the bullæ of the Arctioids, but the development has been behind, not above the spiracle, and is of a wholly different character, as the figure shows. Another interesting development is a deep fovea in the parapleural region of the thorax, across which the suture between postscutellum and epimeron may sometimes be traced. In this series the epimeron, often heavily chitinized, tends strongly to break up, and to develop more complex sculpturing, as is notable in Catocala. Alypia and the Notodontidæ (Fig. 5) show interesting variants of this type. In the latter the lateral cavity is present, but slightly developed, and the alula is rudimentary, not covering it, the lateral flap behind the spiracle is also absent, though the material from which it forms is indicated as a chitinized area about the spiracle that already tends to overgrow the lateral groove. The parapleural fovea is well marked, however, and already undercuts a portion of the parapleura, which makes a stiff and solid connection with the abdomen (partly broken in the figure). This type could well represent the point of origin of the Noctuid one, but is wholly unlike the simple structure of Apatelodes. In Alypia (Fig. 4) we have a second rather simple modification. The parapleural fovea is well marked, but the region about the spiracle is reduced, without any spe-

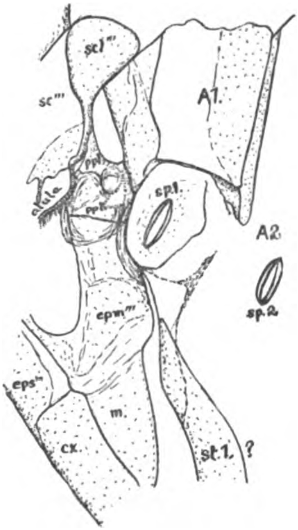

Fig. 5. Same view of *Datana ministra.*

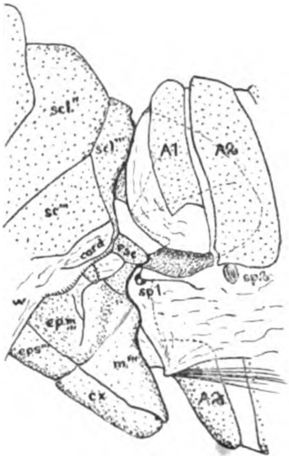

Fig. 4. Same view of *Alypia octomaculata* (Agaristidæ). The internal expansion of the fold between thorax and abdomen is indicated by the dotted lines. A strong suggestion of this structure occurs in some Noctuidæ.

cial sclerites, and in this case the hollow area which normally exists dorsally between thorax and abdomen is very much enlarged, extending back into the second segment, as a thin-walled balloon. In all variants of type three this fold seems much better developed than in the primitive condition.

As to the evolution of these forms I have little doubt that I am correct as to the primitive condition, since it occurs generally in both Micro- and Macrolepidoptera; from it I should derive type three (in its simpler Notodontid subtype) directly, and from that the more specialized subtypes and type two. Type one seems, however, independent. Working this out as a genealogy we will have a first dichotomy between the primitive condition (plus type one) and types two plus three. This corresponds (so far as I recall, exactly) with the division between upright and flat egg, and between the caterpillars with hooks in a single length and those alternately of two lengths, and in those two particulars would dispose of the anomalous position of the Notodontidæ (excluding Apatelodes). It would leave, however, the Notodontidæ as a solitary trifid family in a mass of Quadrifidæ, and would similarly maroon the Lasiocampidæ in a wilderness of trifidæ. Possibly the importance of the position of M^2 in the fore wing is less than it has been considered. Already we give little weight to it in the hind wing, and in certain Hydriomenid Geometridæ, such as Eudule.

FAMILIES EXAMINED.

Primitive type.

Microlepidoptera.
Cossidæ.
Eucleidæ, etc.
Eupterotidæ (Apatelodes).
Bombycidæ.
Saturniidæ.
Sphingidæ.
Lasiocampidæ.

Type 1 (*subventral tympanum*).
Geometridæ only.

Type 2 (*subdorsal bulla*).
Lymantriidæ.
Arctiidæ.
Nolidæ
Syntomidæ.
Pericopidæ.
Herminiini and Epizeuxis of the Noctuidæ.

Type 3 (*parapleural fovea.*)
Notodontidæ.
Noctuidæ.
Agaristidæ.

It should be noted that Brues and Melander, in their key to the families of Lepidoptera erroneously refer to this organ in the Pericopidæ and Geometridæ, as the spiracle; it is perfectly distinct from the spiracle, lying above it in the former, and below in the latter case. So far as I know the spiracle itself is always small and normal, and varies very little in position. It should be noted, however, that the "tympanic opening" of the Dioptidæ (PSYCHE, XXI, 59, alternative 32) is not homologous with thatof the Geometridæ, but is the rudimentary structure noted in Apatelodes, and which becomes enlarged in the Agaristidæ. In the case of the Pericopidæ (alternative 48) the separation from the Arctiidæ is slender, while the majority of Noctuidæ of course completely lack the bulla. The key would really be cleared up by transferring Haploa to the Pericopidæ, where it would not be as wholly out of place as one might think. The Pericopidæ certainly belong here rather than in the neighborhood of the Notodontidæ or Bombycidæ.

SUMMARY AND CONCLUSIONS.

A study of the base of the abdomen in certain Lepidoptera suggests:

1. The Notodontidæ are better placed near the Noctuidæ than near the Geometridæ and Bombycidæ.

2. Apatelodes is not Notodontid, but may be Eupterotid, agreeing in general with the Bombycid series.

3. The Lymantriidæ, Arctiidæ, Nolidæ, Pericopidæ and Syntomidæ are undoubted close relatives, agreeing in a unique specialization.

4. The Noctuidæ, Agaristidæ and Notodontidæ are similarly

grouped, and no reason has developed to separate them widely from the preceding group.

5. The Bombycidæ, Lasiocampidæ, Saturniidæ, Sphingidæ, Apatelodes, and their relatives also form a distinct group, but as they are associated by the absence of specializations in the structures studied, they may be justly divided up on other characters.

6. The tympanic bulla of the Geometridæ is not homologous with that of the Arctiidæ, etc., being developed on the opposite side of the spiracle.

7. A new subfamily, *Cimeliinæ*, is needed for the genus *Cimelia*, based mainly on the following characters: Tympanum absent; Sc of hind wing not angulate at base, without a brace connecting it with the base of the frenulum, closely parallel to R to a point well beyond the end of the cell. Structure otherwise as in the lowest Geometridæ (Œnochrominæ).

SUPPLEMENTARY NOTE: Since writing this article, the Dioptidæ, Thyatiridæ, and Drepanidæ have been examined. The Dioptidæ show no tympanum of any kind and will make a first exception to the rule that uniordinal hooks on the prolegs are coordinated with a tympanum of Arctiid or Noctuid type. The egg is described as spherical, and so may be of either type. In the Thyatiridæ and Drepanidæ there is a new type of tympanum; the tergopleural suture is modified into a large cavity, *opening backward*, which lies beneath the spiracle, and there is a large double chitinized structure subventrally which does not open to the exterior unless it communicates with this tergopleural opening. The structure is so complex, and so similar in the two families as to make their association almost certain, especially as the larval and venational characters are rather similar.

EXPLANATION OF FIGURES.

A = Lower edge of subdorsal muscle with nerve-supply.
A^1, A^2 = First and second segments of abdomen.
A^1 ant. n. = Anterior nerve trunk of first segment of abdomen.
B = Supposed sensory end organ of tympanum.
conn. = Connective.
cx. = Coxa.
epm. = Epimeron (of metathorax).
eps. = Episternum (of metathorax).

int. = Portion of digestive system.
m. = Meron of hind leg.
post. n. = Posterior nerve trunk of first segment of abdomen.
ppl., psc. = Parapleura, or exposed lateral end of postscutellum.
sc″., sc‴. = Scuta of meso-, and metathorax.
scl″., scl‴. = Scutella of meso-, and metathorax.
sp¹., sp². = First and second abdominal spiracles.
subal. = Subalar sclerite of metathorax.
tymp. = Tympanum.

1. Side view of metathorax and base of abdomen of *Apatelodes torrefacta* (Eupterotidæ), showing primitive macrolepidopterous arrangement of sclerities.

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BOOK REVIEWS.

THE RHYNCHOPHORA OR WEEVILS OF NORTHEASTERN AMERICA. By W. S. Blatchley and C. W. Leng.

This important work is the first general treatment of any considerable portion of the Rhynchophora of North America for forty years and is even more comprehensive than that of LeConte and Horn for the chosen district. Its possession should remove from the collector of eastern North America any temptation to throw away or even neglect his captures of this suborder.

In this work of 682 pages the coleopterist will find efficient keys to the families, tribes, genera, and species known to occur east of the Mississippi River. Full descriptions of 1,084 species are given. It is illustrated by 155 very good figures, 21 of which, together with about 7 pages of text, are devoted to the explanation of the structures used in the classification. Four new genera, 74 new species and 5 new varieties, the majority of them from Indiana and Florida, are described by the pen of the senior author.

The general scheme of the "Coleoptera of Indiana " has been followed throughout the text, with the addition of seven pages of Bibliography and a 3-page index to the plants mentioned in the generous notes on distribution, occurrence and habits that follow the description of each species. The classification used is mainly that of LeConte and Horn, modified where necessary by the results of recent studies in the suborder.

The amount of work represented by this volume can better be appreciated after reading the Introduction. In all cases where possible the descriptions have been written from the actual specimens themselves and in connection with the original descriptions, while the senior author has visited the principal museums and many public and private collections in the East to compare doubtful specimens with the types. It is very evident that the authors have spared no efforts to present accurate determinations and careful descriptions, and the results of their labors should stimulate the study of this somewhat neglected group of beetles.

We hope that the coöperation by which the scope and usefulness of this work has been increased will not escape the appreciation of its students, for each author has sacrificed his partly completed work to this end. No such example of the subordination of self to the interests of science has been placed before the American Coleopterists since the days of LeConte and Horn.

C. A. Frost.

It is with great regret that we have to record the passing of Otto Heidemann, who died on November 17, 1916, at the age of seventy-three. For many years he has been in charge of the Hemiptera in the United States National Museum, faithfully performing the arduous routine duties of the position, and yet finding time to publish a considerable number of contributions to the literature of his specialty. More than this, he was always ready to share his great knowledge of the Hemiptera with all who sought his advice, and it can safely be said that a large part of the hemipterological work published in America since the days of Uhler has been based upon his store of information, avowedly or not. Thoroughness in his work, kindliness in his relations with others, and self effacement when his own interests were at stake went to make up a rare nature which can ill be spared.

Through the kindness of Mr. John Howard Paine we are enabled to present in this issue a very excellent and characteristic portrait of Mr. Heidemann.

EXCHANGE COLUMN.

Notices not to exceed four lines in length concerning exchanges desired of specimens or entomological literature will be inserted free for subscribers, to be run as long as may be deemed advisable by the editors.

The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's Insects of New Jersey.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

Offered for cash, but exchange preferred. Fitch and early Illinois reports; Insect Life; Harris's Insect; many others.—J. F. Hallinen, Cooperton, Okla.

Histeridæ. North American Histeridæ identified or unidentified, desired in exchange for beetles of other families. F. G. Carnochan, Bussey Institution, Forest Hills, Massachusetts.

Hemiptera-Heteroptera. I desire specimens of this group from all regions, especially New England. I will give in exchange species of this and other orders (except Lepidoptera), and will identify New England material. Correspondence desired.—H. M. Parshley, Bussey Institution, Forest Hills, Mass.

Wanted: Psyche, Vol. IX, No. 300 (April, 1901). Address, giving price, Librarian, Stanford University, Cal.

Sarcophagidæ from all parts of the world bought or exchanged according to arrangement. North American material determined.—R. R. Parker, Entomological Laboratory, Massachusetts Agricultural College, Amherst, Mass.

Wanted: Transactions American Entomological Soc., Vol. 4; Entomological News, Vol. 2, Nos. 6 and 10; Vol. 8, Nos. 1 and 6; Vol. 9, Nos. 1 and 2; Vol. 10, No. 10; Vol. 11, Nos. 1, 3 and 5. Will purchase at reasonable price.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

Wanted: Insects of any order from ant nests, with specimens of the host ants, from any part of the world; also Cremastochilinæ of the world. Will give cash or Coleoptera, Hymenoptera and Diptera from the United States.—Wm. M. Mann, Bussey Institution, Forest Hills, Boston, Mass.

Wanted: Transactions American Entomological Society, vol. 4. Also will purchase specimens of Catocola Sappho.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

Wanted: Old Series Entom., Bul. 1, 2, 3, 33; Technical Series 4, 6, 7; Insect Life, vol. 4–6; Jour. Applied Microscopy I, N. Y. State Entom. Rep. 3, 4; Fitch Rep. 7, 8, 13.—Philip Dowell, Port Richmond, N. Y.

Would appreciate receiving date, stage and mode of hibernation of insects of all orders. J. P. Baumberger, Bussey Institution, Forest Hills, Boston, Mass.

Wanted: Ill. Ent. Rpts. 2, 3, 5, 7. 9, 10, 11, 12, 13, 19; Hensham's List of the Coleoptera of America North of Mexico, 1895. For Exchange Bulletins and Circulars U. S. Bur. Ent.—J. S. Wade, Wellington, Kan.

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PSYCHE.

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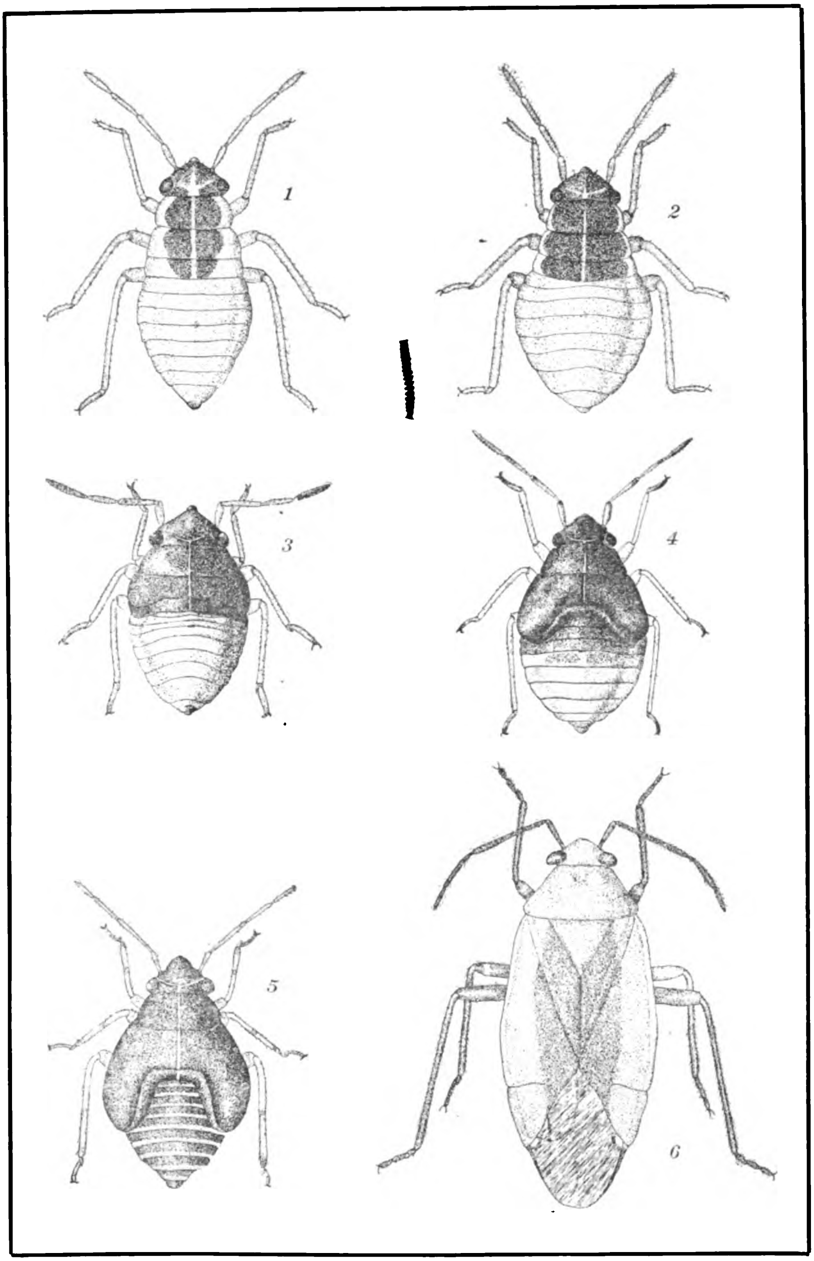
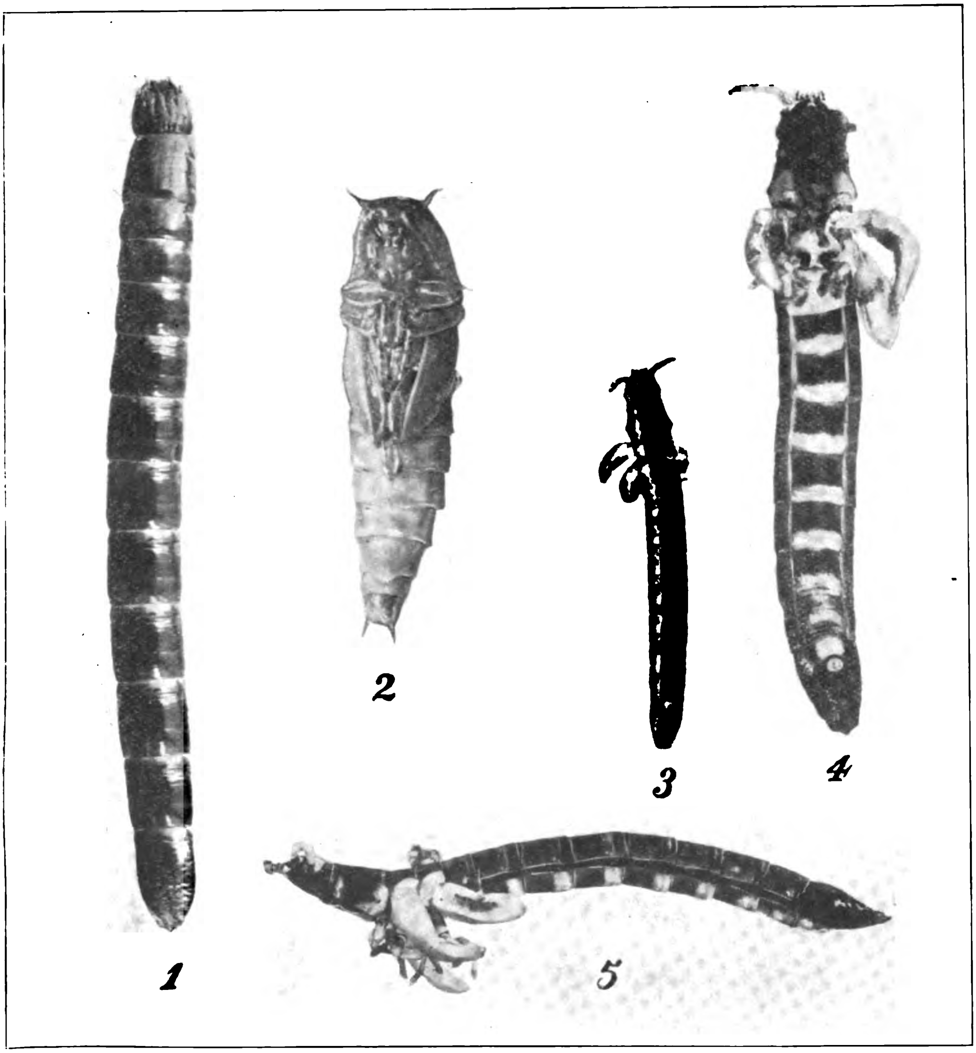
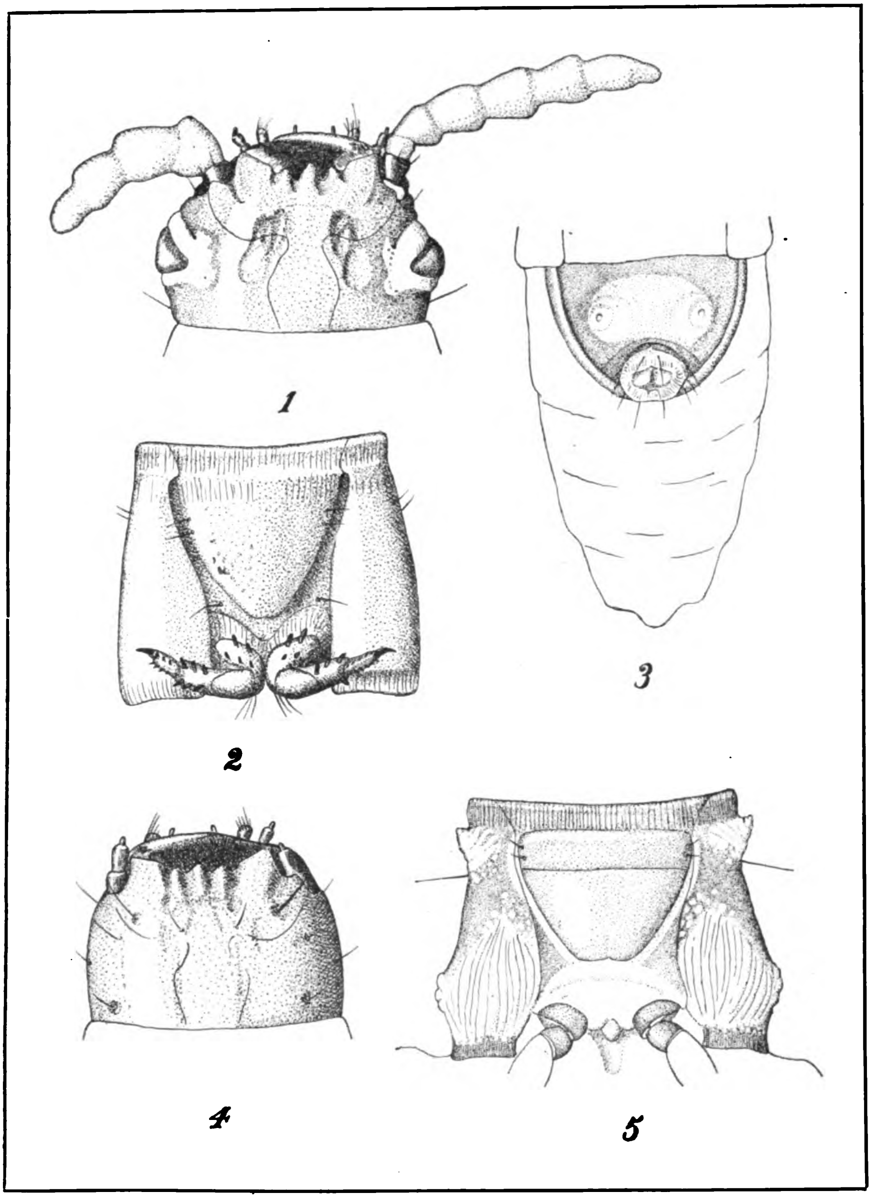


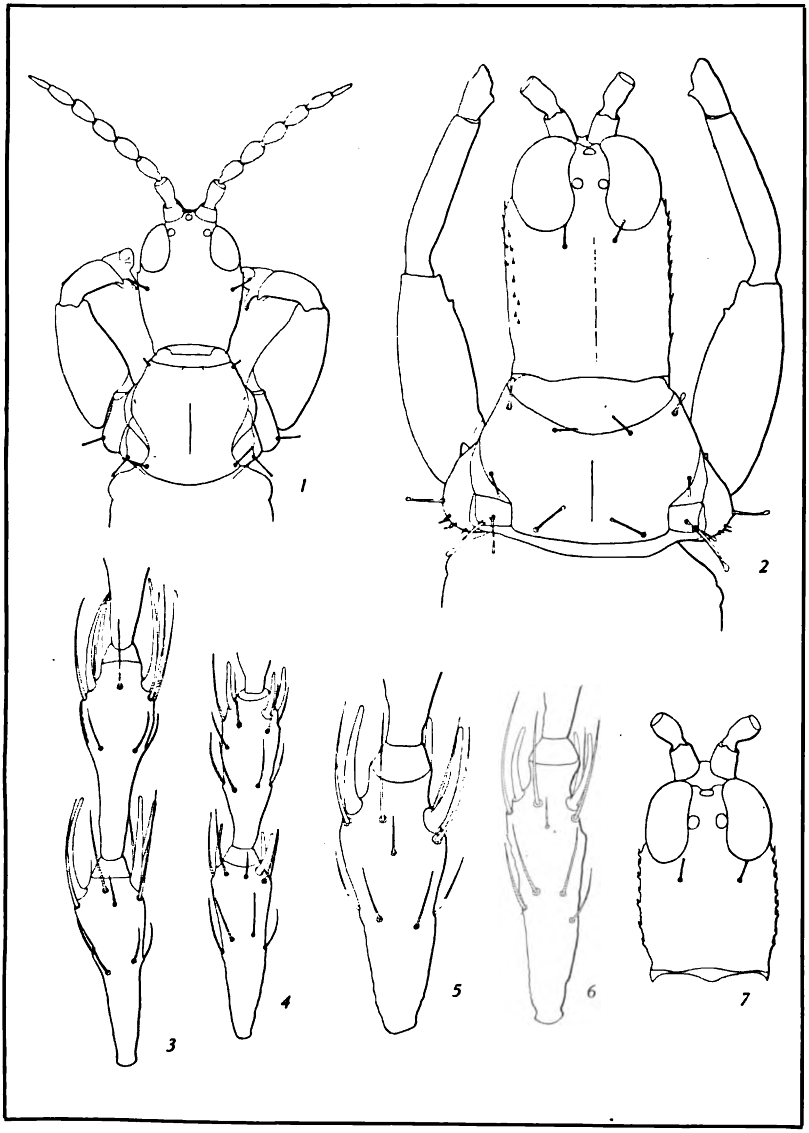
Leonard—*Tropidosteptes cardinalis.*



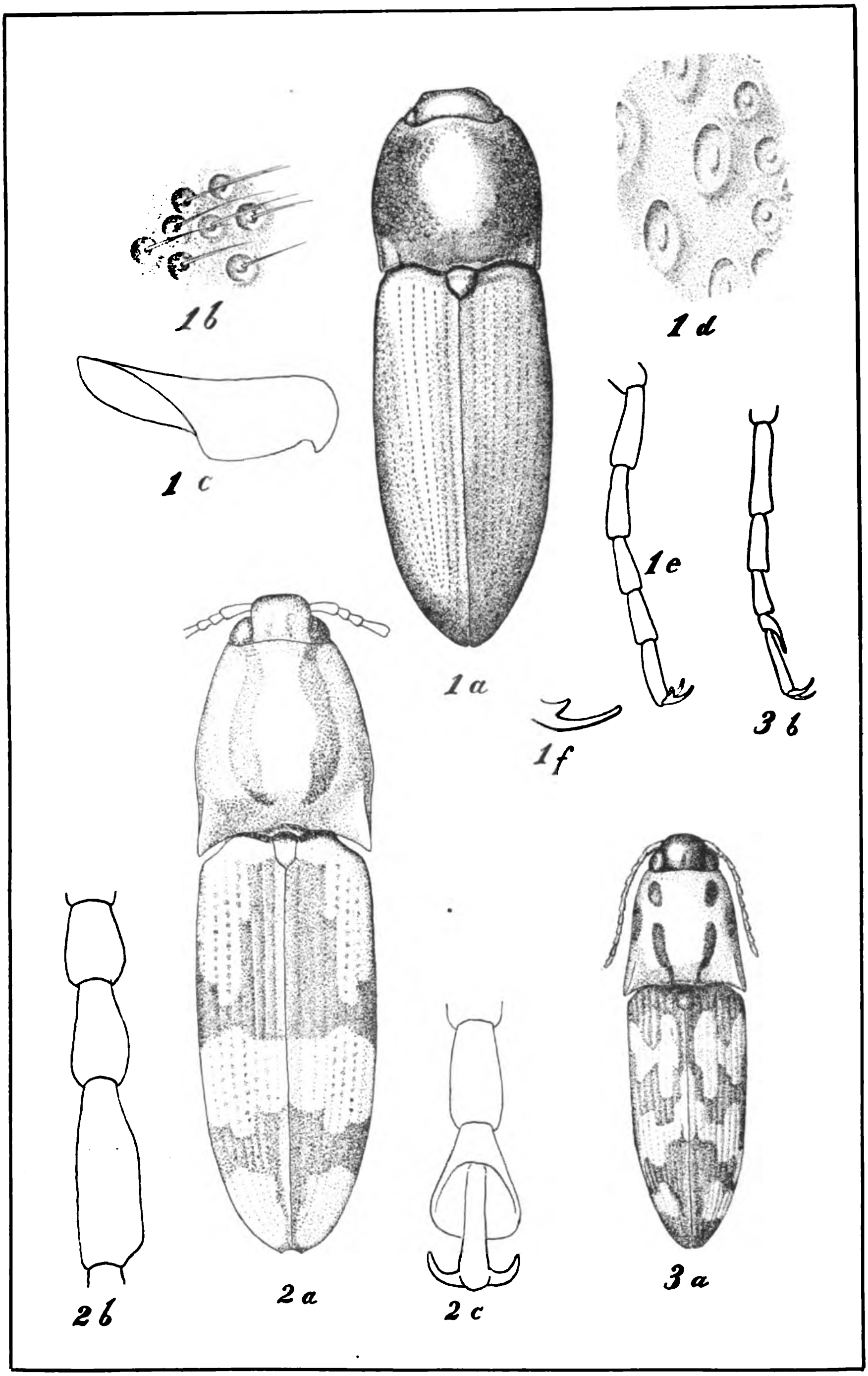
Normal and prothetelous larva and normal pupa of *Melanotus communis*. Fig. 1, dorsum of normal larva. Fig. 2, ventron of pupa. Fig. 3, dorsum of prothetelous larva. Fig. 4, ventron of prothetelous larva. Fig. 5, lateral aspect of prothetelous larva.



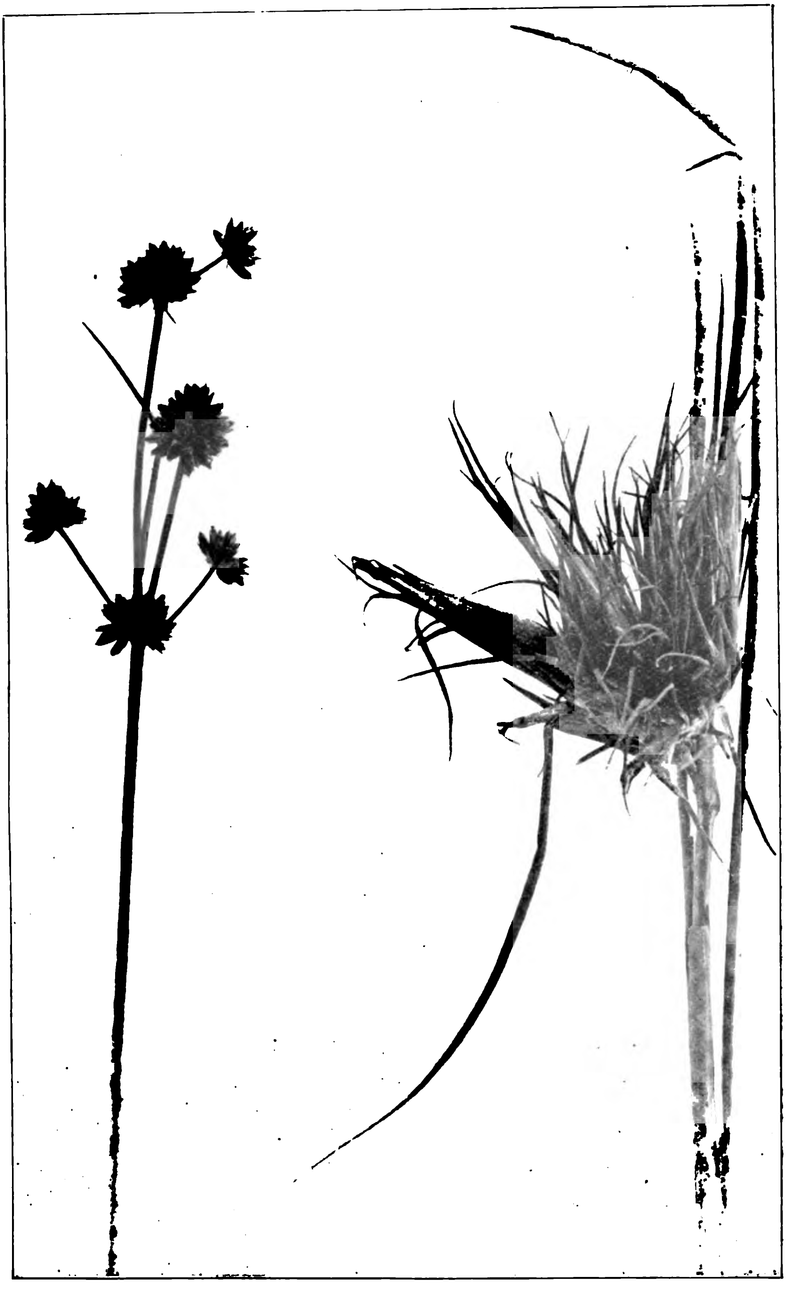
Melanotus communis normal and prothetelous larva. Fig. 1, dorsum of the head of prothetelous larva. Fig. 2, prosternum of normal larva. Fig. 3, 9th and 10th abdominal segments of prothetelous larva. Fig. 4, dorsum of head of normal larva. Fig. 5, prosternum of prothetelous larva.



HOOD—*New Thysanoptera.*



HYSLOP—New species of *Elateridæ*.



Two stems of rush, one with normal inflorescence contrasted with the large galled specimen showing the work of *Livia maculipennis*.

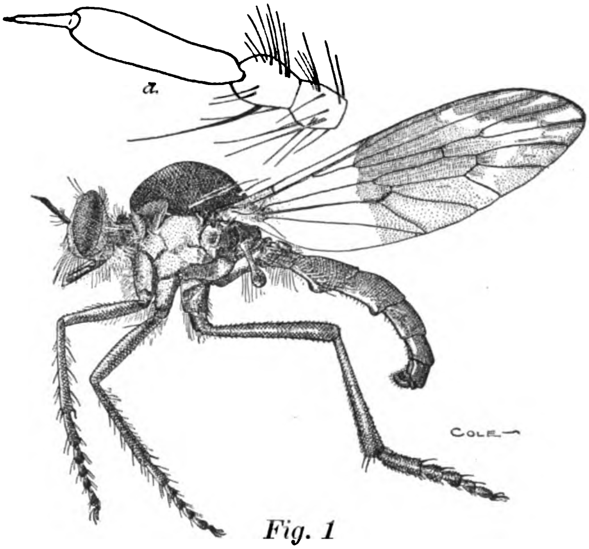


Fig. 1

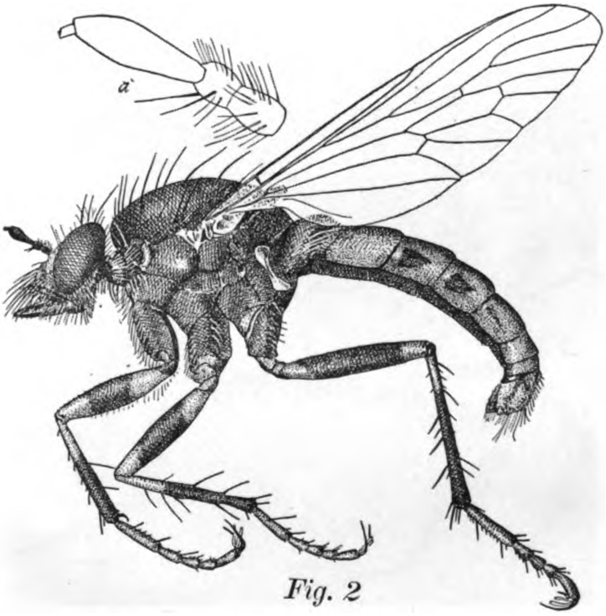


Fig. 2

COLE—*New Asilidæ.*

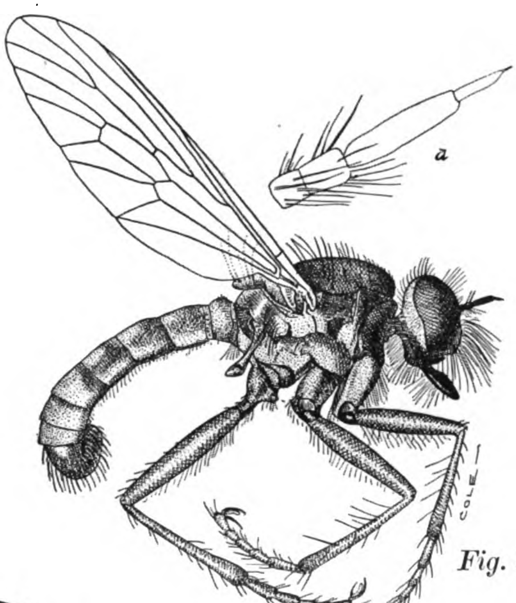


Fig. 3

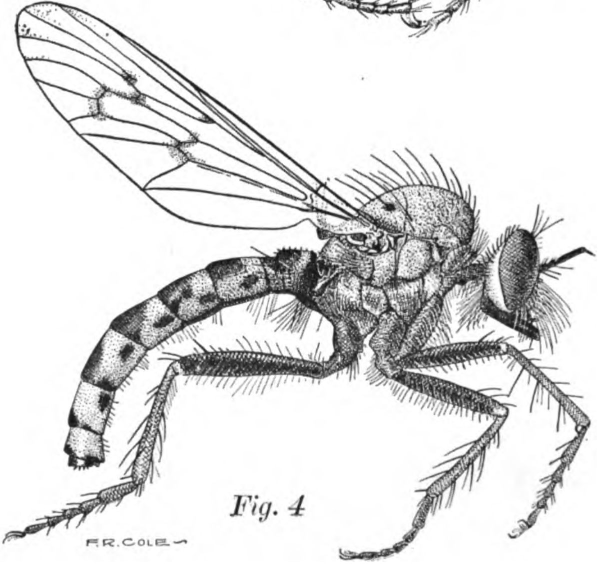


Fig. 4

Cole—*New Asilidæ.*

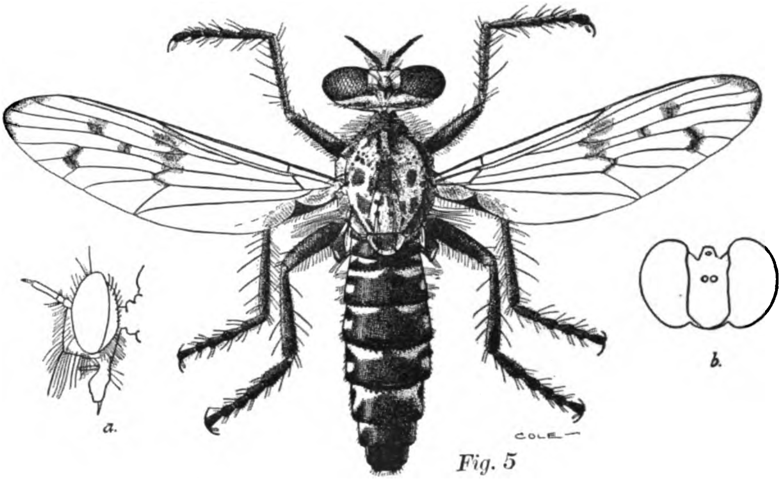


Fig. 5

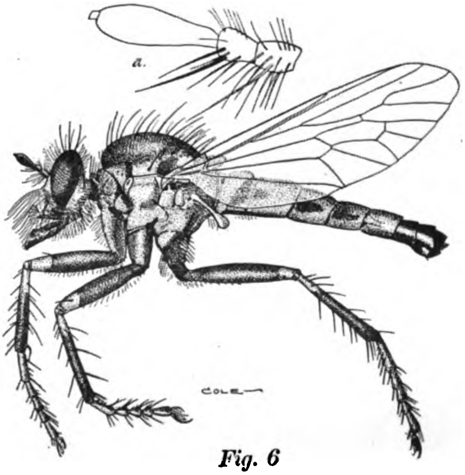
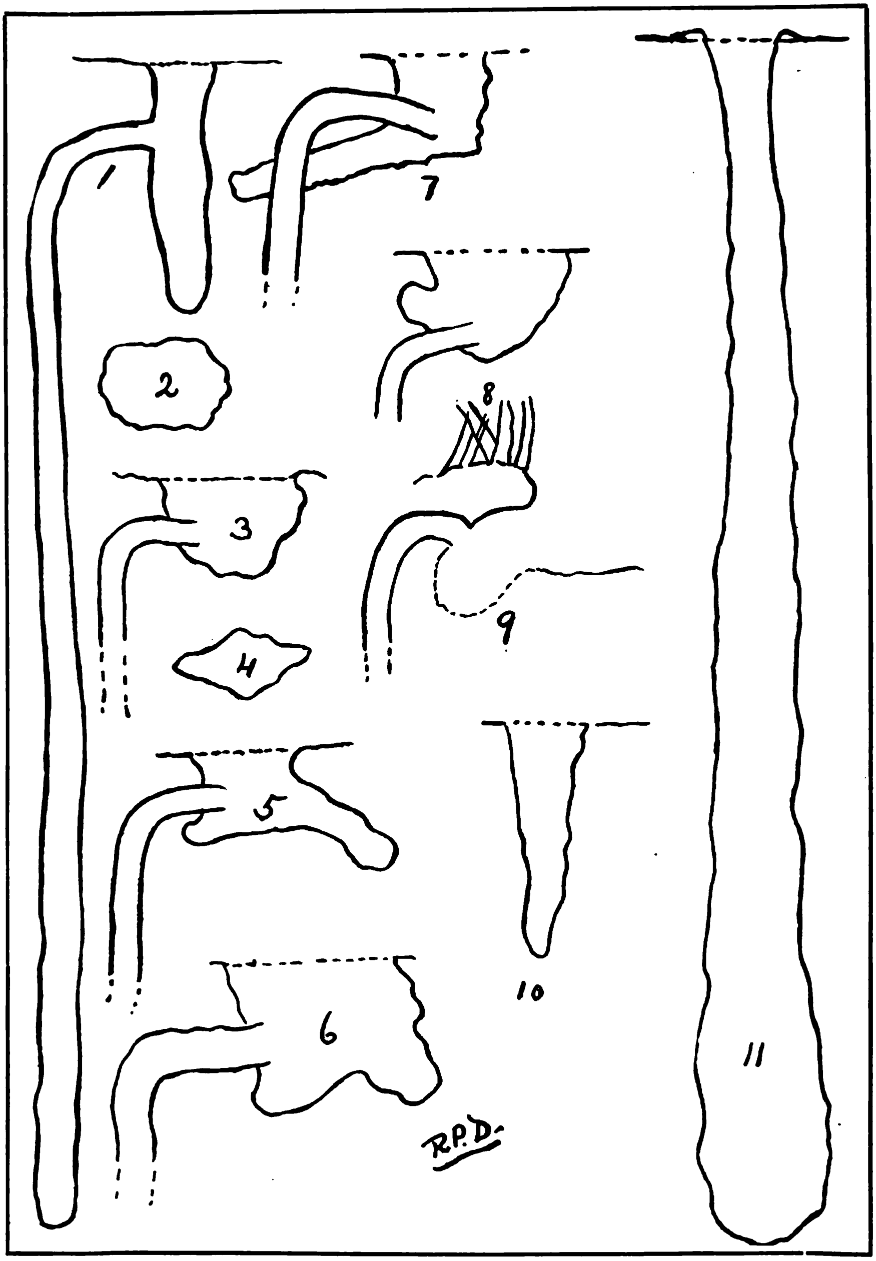


Fig. 6

Cole—*New Asilidæ.*



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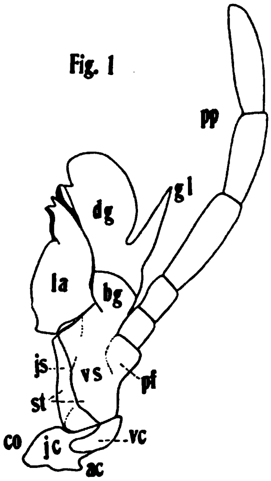

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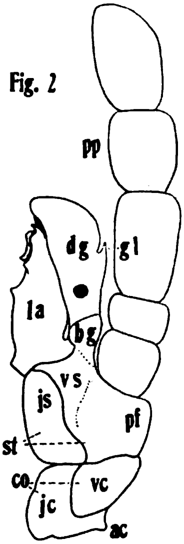

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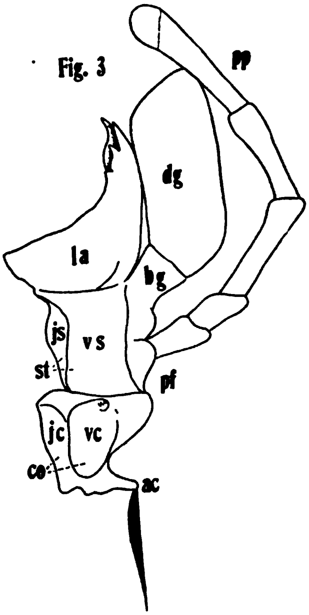
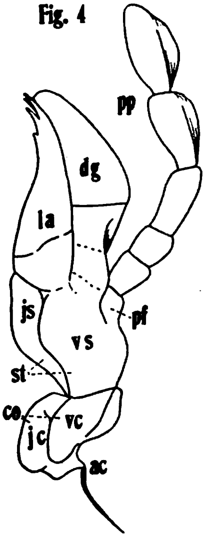


Fig. 4



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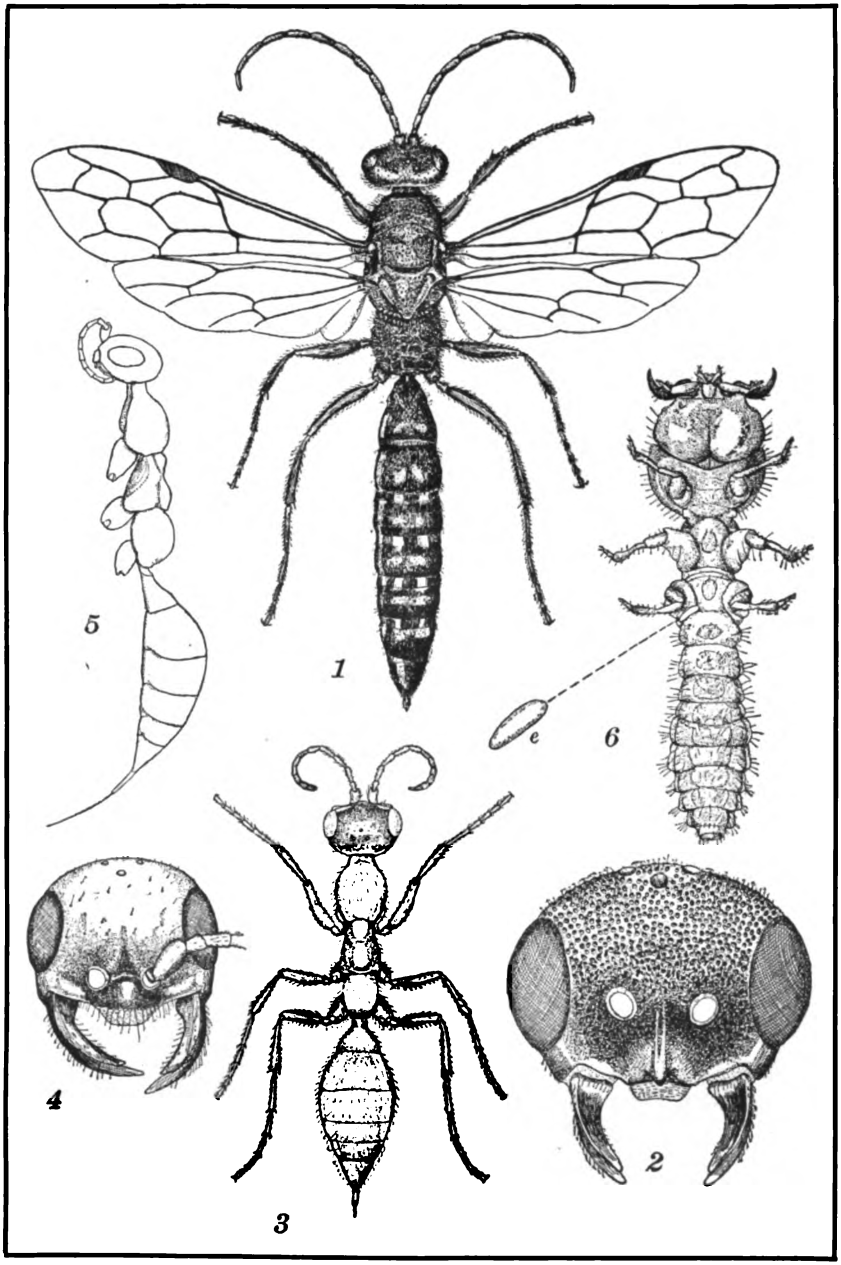

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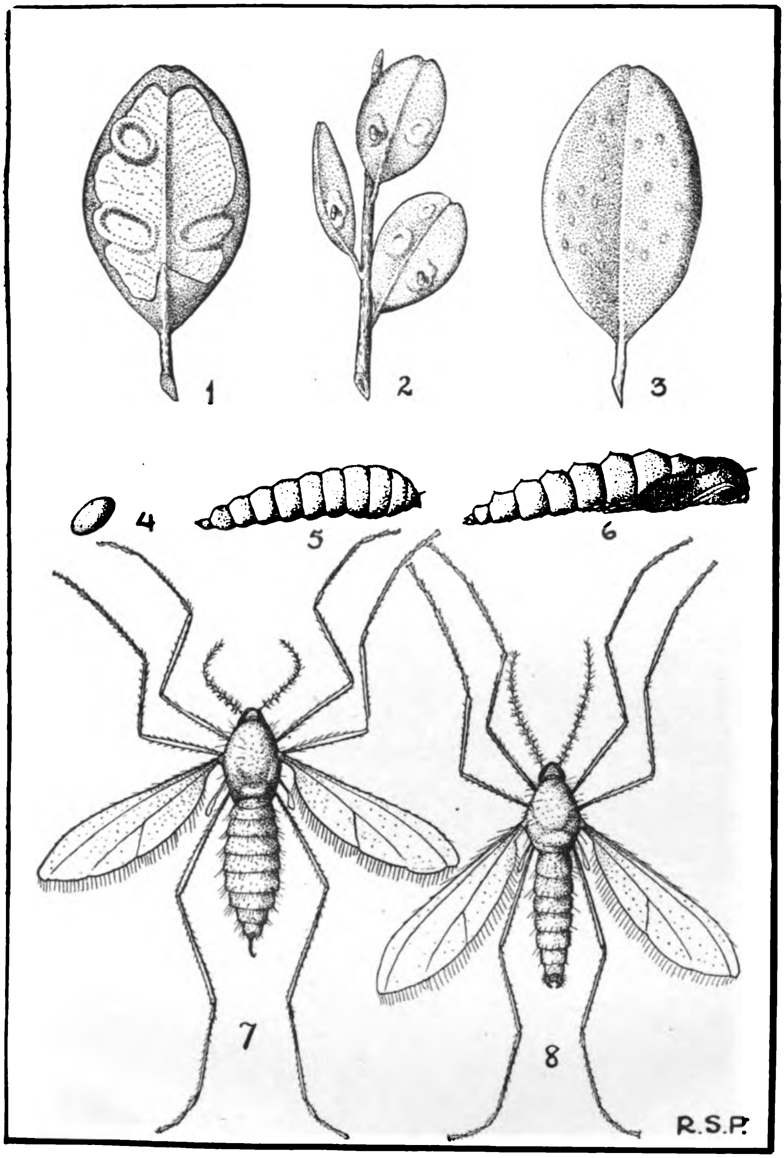

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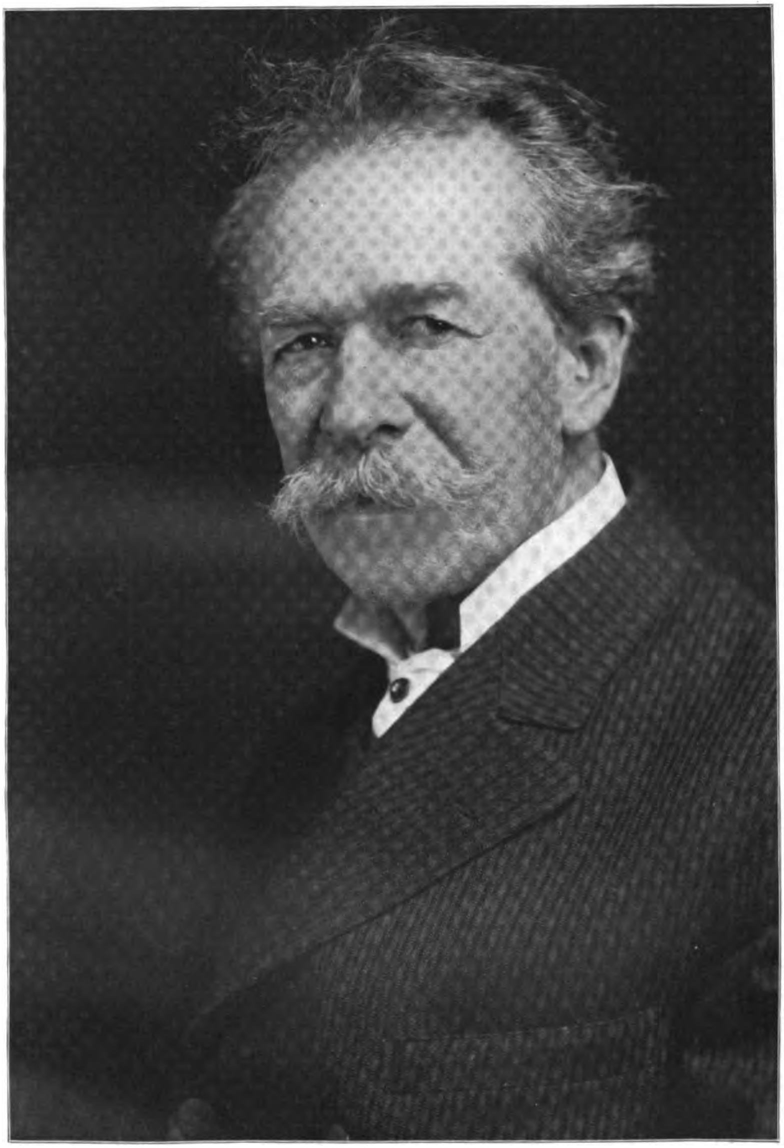

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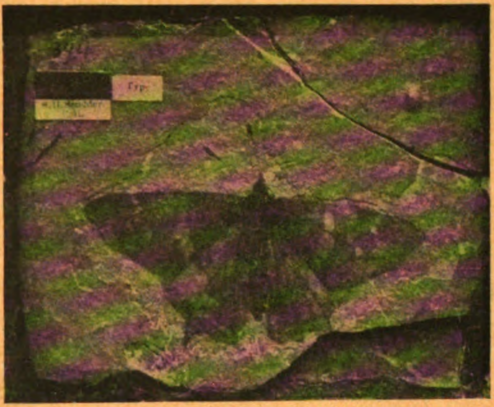

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PSYCHE

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THE GROWTH OF INSECT BLOOD CELLS IN VITRO.[1]

BY R. W. GLASER.

In order to obtain an insight into various pathological changes taking place in diseased insect tissue, I undertook a series of experiments dealing with the cultivation of such tissue in vitro. The degenerative changes occurring in normal and in pathological blood cells were especially studied for the reason that the blood is frequently used in diagnosing the health of a particular insect. In the polyhedral diseases of insects a general picture of the progress during the later stages of the disease can be obtained by examination of the blood. This type of disease is recognized by the fact that nucleoprotein reaction bodies, termed polyhedra, are formed within the nuclei of the blood and certain other tissue cells. It was also of considerable interest to ascertain whether slides with growing insect tissue could be infected with the polyhedral disease virus and whether polyhedra would form within the nuclei of cells thus infected. By way of comparison, it was also of interest to see through what changes normal cells pass when permitted to degenerate naturally.

Incidentally, a number of observations were made in regard to the morphology and behavior of growing insect blood cells and I will present the observations in the hope of stimulating work along these lines. Although the cultivation of insect tissue is not new, this method of studying various embryological, morphological, and physiological questions pertaining to entomology has been almost entirely neglected and I am convinced that the cultivation of tissues will greatly simplify the solution to many difficult problems.

Goldschmidt in 1915, by means of the tissue culture method, which the host feeds. The maggots attach themselves to the caterpillar host as it crawls over the food plant, and later bore their way into its interior. Recently Mr. J. L. King, of the Ohio Experiment Station, has given us an extremely interesting account of the same general habit, the subject of his studies being the Cyrtid *Pterodontia flavipes* Gray, a parasite of spiders.[1] Up to the present time, however, no such startling deviation from the normal has been observed in the parasitic Hymenoptera.

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[1] Contribution from the Entomological Laboratory of the Bussey Institution in coöperation with the U. S. Bureau of Entomology. (Bussey Institution No. 125.)

In 1909 and 1910 the writer, while engaged in the study of the hymenopterous parasites of the Gipsy and Browntail Moths at the laboratory of the U. S. Bureau of Entomology, Melrose Highlands, Mass., carried on an investigation of the life-history and habits of *Perilampus hyalinus*, a hyperparasite of the Fall Webworm. In brief the life-history of this chalcidoid parasite was found to be as follows: Nothing in regard to the egg-laying habits could be ascertained. The first stage larva, however, a very curious being, heavily armored with chitinous plates and provided with numerous curved hooks and spines, was found crawling about on the outside of the caterpillar. Later these first stage larvæ or planidia were found to bore their way into the body cavity of the caterpillar, there swimming about freely until the primary parasite larva, either hymenopterous or dipterous, was found, and into which they gained entrance. The Perilampus larva then remained quiescent until the primary parasite became full-fed and made its exit from the caterpillar to spin its cocoon or form its puparium. At the time of ecdysis the planidium found its way to the exterior of the host, after which it fed as an ectophagous parasite in the normal way. The egg-laying habit of this strange parasite has, however, remained a puzzle to entomologists, and at that time the writer made the following statement in regard to it:[2]

"There have been made, so far as published records go, at any rate, no observations upon the oviposition of members of the genus *Perilampus*. It is known, however, that oviposition does not occur in the normal way, or in the manner we are accustomed to regard as the normal method of oviposition among the parasitic Hymenoptera, and for this reason speculations on what may actually occur are rather interesting.

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[1] King, J. L., Observations on the Life-history of *Pterodontia flavipes* Gray (Diptera). Annals Ent. Soc. Am., Vol. IX, p. 309-321 (1916).

[2] Smith, Harry S., The Chalcidoid Genus Perilampus, and its Relation to the Problem of Parasite Introduction. Bull. U. S. Dept. Agric., Bur. Ent. Tech. Ser., No. 19, pp. 33-69, 1912.

"In the first place it is obvious from the facts recorded in the preceding pages that *Perilampus* does not oviposit directly in or upon its host. In the second place, it does not oviposit within the caterpillar of which its host is a primary parasite, which is equally obvious from the observations already made. That it places its eggs *upon* the young caterpillar is improbable, the adult *Perilampus* being too slow and clumsy to be capable of accomplishing this act with any degree of certainty.

"There are two plausible methods which *Perilampus* might adopt for the deposition of its eggs, and the writer is strongly inclined to the view that one of these methods is in part at least correct. As in the case of some of the parasitic beetles, it may deposit its eggs upon flower heads or upon leaves of plants not in the immediate vicinity of the caterpillar colony, the planidia hatching from these eggs being conveyed to the caterpillars by means of some intermediate carrier. In the Coleoptera cited above the carrier is frequently a parasitic bee upon which, by means of their claws, the triungulins attach themselves and are conveyed to the nest of their host. With *Perilampus*, should this method prove to be the one which really takes place, the intermediate carrier might be any of the primary parasites which attack *Hyphantria;* that is, the hymenopterous parasites *Limnerium* or *Apanteles*, or the Tachinid *Varichœta*. The planidium seems more or less fitted for this sort of a life and is apparently analogous to the triungulin of the coleopterous parasites. The chitinous plates with which it is armored are especially serviceable in preventing injury of various kinds, and the mandibles and hooks and spines would serve it very well as a means of clinging to its conveyer. . . .

"The other method, which seems much more plausible, is that of oviposition upon the food plant *in the vicinity of a colony* of the caterpillars. This would do away with the necessity of an intermediate carrier, but would expose the delicate eggs to great danger unless they hatched immediately after deposition. . . .

"While the eggs of *Perilampus* have not been observed after deposition, those contained in the ovarian tubes, in one case apparently mature, have been examined. They are of the usual elongate-oval shape, not stalked, and whitish in color."

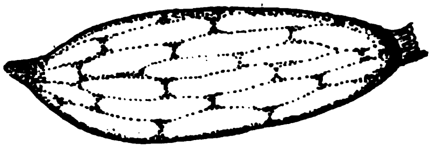

Fig. 1. Egg of *Perilampus chrysopæ* var., greatly enlarged. (Original.)

For seven years the writer has been looking for a chance to corroborate or disprove the theories advanced in the above statement, but the opportunity did not present itself until about two weeks ago. During the previous summer specimens of *Perilampus* were occasionally bred from *Chrysopa* cocoons. Recently the writer was successful in capturing several adult female *Perilampus*[1] of this species hovering about oleanders infested with *Aphis nerii* and fed upon by *Chrysopa*. The insects were then watched and were observed frequently to touch the tip of the abdomen to the leaf. On placing the leaf under the binocular microscope the minute transparent eggs of the *Perilampus* were seen, one end of the egg being slightly attached to the leaf. This observation proved the correctness of the original theory and established beyond doubt the habit of leaf-oviposition among the parasitic Hymenoptera. The eggs are numerous, one female depositing fifty-two in a single day. They are pearly white in color, about twenty-five one-hundredths millimeter in length, and are characteristically sculptured. The egg is very faintly attached to the

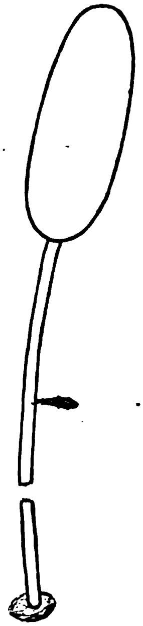

Fig. 3. Planidium of Perilampus attached to egg-stalk of Chrysopa. (Original.)

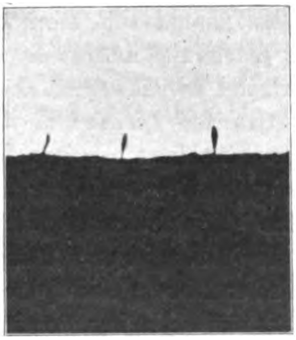

Fig. 2. Planidia of *Perilampus chrysopæ* var., attached to edge of oleander leaf and awaiting the approach of Chrysopa larva. (Original, photographed from life.)

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[1] Determined by J. C. Crawford as *Perilampus chrysopæ* Crawford, new variety.

surface of the leaf at one end. Hatching takes place in seven to ten days and the first stage larva is of the planidium type described in the above mentioned paper. For several days previous to hatching the dark-colored planidium can be plainly discerned through the transparent egg-shell. The planidium is active immediately upon hatching, crawling rapidly about, but soon it attaches itself to the leaf by means of the caudal sucker and stands out at right angles to the surface. In this position it remains for days at a time, motionless, excepting when some insect comes within its reach, when it suddenly becomes frantically active, reaching and swaying back and forth in its attempt to attach itself to the prospective host. If the latter should unfortunately come too near, the planidium attaches itself with lightening-like quickness to a hair or bristle of the host. It then leisurely crawls down the hair to the host's body and attaches itself by its mouth-hooks. Quite often the planidia are found attached to the egg-stalk of *Chrysopa*, assuming a position at right angles to the axis of the stalk. This shows an interesting instinct in the planidium, since it may and actually does, as the writer has observed, waylay the young Chrysopa larva as it leaves the egg and crawls down the stalk. The prescience of the mother Chrysopa in placing her eggs at the end of a long egg-stalk to overcome the cannibalistic propensities of her progeny is in this case their undoing, since the planidium attached to the Chrysopa egg-stalk is sure to reach its proper host, while those upon the surface of a leaf are quite as likely to attach themselves to an aphid or other insect.[1]

The planidia are remarkably long-lived for such delicate creatures. I have had them live for a period of seventeen days without food of any kind and without changing their position. Those which are fortunate enough to become attached to a Chrysopa larva immediately, as mentioned above, crawl down the hair or bristle and by means of their mouthparts attach themselves to the skin of their host. Many of these planidia undoubtedly lose their opportunity to develop through the moulting of the Chrysopa larva, although sometimes, as observed by the writer in the laboratory, they succeed in changing their position from the moult-skin to the newly moulted host. In cases where the Chrysopa larva died in the laboratory, the planidium invariably crawled out on the end of a hair, attached itself by the caudal sucker and awaited the approach of a new host. Apparently the planidium takes no nourishment until the Chrysopa larva spins its cocoon and pupates, after which it begins to feed and develops in much the same way as the writer has described for *P. hyalinus* (*loc. cit.*), excepting that it is never an internal parasite so far as has been observed.

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[1] In a note in the Journal of Economic Entomology, Vol. 9, p. 510, Mr. M. T. Smulyan mentions having found a Perilampus planidium on an aphid. Without doubt this is the young of a Chrysopa infesting species which attached itself to the wrong host. They will even grasp a camels hair brush if brought within their reach.

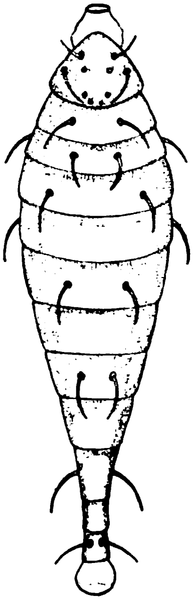

Fig. 4.—Planidium of *Perilampus chrysopæ* var., greatly enlarged. Dorsal view. (Original.)

It is difficult to understand just what is gained, from the standpoint of *Perilampus* infesting *Chrysopa*, by this extraordinary habit, since the Chrysopa larva is easily accessible to the normal method of oviposition and is in fact parasitized in the larval state by a number of parasites which oviposit directly into the host. In the case of *Perilampus hyalinus*, however, and other species having similar habits, the advantage is obvious, since by no other method could access be had to the larvæ of the primary parasites. In the case, too, of those species of Perilampus infesting wood-boring Coleoptera and gall-making and stem-infesting Lepidoptera (the correctness of which records the writer is frank to confess he previously looked upon with doubt), the usefulness of this method of oviposition taken with the active planidium stage is readily seen, since in this way access is easily gained to the endophagous host through the wanderings of the planidium. Needless to say, this type of reproduction forms one of the most extraordinary adaptations to environment in the entire field of entomology.

KEY TO THE SPECIES OF LEPTOGLOSSUS GUÉR. OCCURRING NORTH OF MEXICO (HETEROPTERA; COREIDÆ).

By Edmund H. Gibson,
Bureau of Entomology, Washington, D. C.

The cosmopolitan genus Leptoglossus Guér. is represented in America, north of Mexico, by nine species all of which are listed in Van Duzee's recent check list. Specimens bearing labels of two other species, namely *balteatus* Linn. and *stigma* var. *minor* Dall. are in the collection of the U. S. National Museum, but I believe them to have been wrongly determined.

This genus belongs to the tribe Anisoscelini A. & S. and may be separated from Chondrocera Lap. and Narnia Stal, the other two genera of the tribe which are known to occur in North America, by the large dilations of the hind tibiæ and simple antennæ which have their basal joint long.

In working out the key to the species, color markings have been eliminated as far as possible. Specimens of each species have been examined and in practically each one access has been had to large series, which are in the collection of the U. S. National Museum.

Leptoglossus Guér.

Leptoglossus Guér., Voy. de la Coquille, Ins., p. 174, 1838.

Anisoscelis Spin., Ess. Hem., p. 200, 1837.

Theognis Stal, Stettiner, Ent. Zeitg., xxiii, p. 294, 1862.

Leptoglossus Guér. may be characterized as follows: Head elongate, horizontal. Antennæ rather stout but not swollen or dilated, basal joint long, about equal to length of the head; rostrum passing the metasternum; bucculæ short. Thorax longer than head, broad and rounding posteriorly. Elytra narrowing towards apex. Hind femora more or less swollen; hind tibiæ with large dilations of foliations, the outer margins of which are usually more or less deeply scalloped. Spiracles at base and apex of abdomen about equally remote.

The haplotype of the genus is *dilaticollis* Guér.

Key to the species of Leptoglossus occurring north of Mexico.

1. Thorax coarsely punctate or rugose........*fulvicornis* Westw.
   Thorax not rugose, only finely punctate..................2
2. Apex of head terminating in a stout spine.....*clypealis* Heid.
   Apex of head without a spine...........................3
3. Fourth joint of the antennæ equal to or shorter than the third joint...4
   Fourth joint of antennæ longer than third joint............5
4. The outer expansion of the hind tibiæ reaching almost to apex of tibiæ, lanceolate.......................*corculus* Say
   The outer expansion of the hind tibiæ reaching but two thirds the length of tibiæ, foliaceous...........*occidentalis* Heid.
5. Lateral-posterior margins of thorax more or less crenulate.....6
   Lateral-posterior margins of thorax not crenulate, and with only a mere trace of a transverse color band or line on the elytra.................................*oppositus* Say
6. Posterior angle of thorax terminating in a prominent spine *gonagra* Fabr.
   Posterior angles of thorax not terminating in a prominent spine...7
7. Thorax bordered with bright orange and foliation of hind tibiæ short................................*ashmeadi* Heid
   Thorax not bordered with orange. Foliation of hind tibiæ large and long...8
8. Scallops in the foliations of the hind tibiæ deep and long. Posterior femora prominently incrassated.......*zonatus* Dall.
   Scallops in the foliation of hind tibiæ shallow and usually short. Posterior femora swollen but not prominently incrassated *phyllopus* Linn.

Leptoglossus fulvicornis Westw.

Leptoglossus fulvicornis Westw., Hope Cat., 11, p. 17, 1842.

Leptoglossus magnoliæ Heid., Pro. Ent. Soc. Washington, xii, 1910, p. 191.

This is a large species and can be distinguished from all others by having the thorax coarsely punctate or rugose. Antennæ and first two pairs of legs light in color. No band or markings on elytra. Posterior angles of thorax broadly rounded and prominently raised.

It ranges from Maryland southward through Florida and Alabama.

Leptoglossus clypealis Heid.

Leptoglossus clypealis Heid., Pro. Ent. Soc. Washington, xii, p. 195, 1910.

The apex of the head terminating in a spine is the character which readily distinguishes this species from all others of the genus.

This is a western species occurring from Nebraska to Oregon, south through California, Arizona and New Mexico.

Leptoglossus corculus Say.

Anisoscelis corculus Say, Ent. of N. A., Vol. 1, p. 326, 1832.

Theognis excellens Mayr, Verh. Zoöl.-bot. Ges. Wein., xv, p. 434, 1865.

Together with the following species corculus has the fourth joint of the antennæ equal to or shorter than the third. This character may be used to separate these two species. *Corculus* differs markedly from occidentalis in having the dilation of the hind tibiæ lanceolate and reaching nearly to the apex of the tibiæ, while the dilation in occidentalis is foliaceous and much shorter.

It is known to occur from New Jersey southward through Georgia, and west to Colorado.

Leptoglossus occidentalis Heid.

Leptoglossus occidentalis Heid., Pro. Ent. Soc. Washington, xii, p. 196, 1910.

Following his description of the species Mr. Heidemann states: "This species has frequently been determined as *L. corculus* Say—but by close observation the differently shaped expansion of the hind tibiæ will distinguish it at once." The expansion is shorter and foliaceous.

The known distribution is from Colorado west to the coast and from California north to Vancouver.

Leptoglossus oppositus Say.

Anisoscelis oppositus Say, Ent. of N. A., Vol. 1, p. 326, 1832.

Anisoscelis tibialis H. S., Wanz. Ins., Vol. 7, p. 12, 1844.

The distinguishing characters for this species are the smooth lateral-posterior margins of the thorax and the unmarked elytra.

Only occasionally is there a faint transverse line on the elytra. The foliations of the hind tibiæ are large with deep scallops.

This is probably the most common species in the United States. It is primarily a southern species but is known to occur as far north as New Jersey.

Leptoglossus gonagra Fabr.

Cimex gonagra Fabr., Syst. Ent., p. 708, 1775.

Cimex grallator Herbst., Gem. Naturg., vi, p. 239, 1784.

Anisoscelis antica H. S., Wanz. Ins., iii, p. 92, 1835.

Anisoscelis præcipua Walk., Cat. Hem. Het. British Mus., p. 128, iv, 1871.

This is a large species and easily recognizable by the broad thorax, the lateral-posterior angles of which terminate in a prominent spine, and also by the yellow transverse curved line on the anterior portion of the thorax. It is strictly a southern species.

Leptoglossus ashmeadi Heid.

Leptoglossus ashmeadi Heid.. Bul. Buffalo Soc. Nat. Sci., ix, p. 237, 1909.

Of the species occurring north of Mexico this is the most easily recognized one. The exceptionally short foliation of the hind tibiæ and the bright orange coloration on the head and thorax make the identity unmistakable. Mr. Heidemann recorded it only from Florida.

Leptoglossus zonatus Dall.

Anisoscelis zonatus Dallas, List. Hem. Brit. Mus., ii, 1852.

Closely related to *phyllopus* Linn. but from which it can be separated by having the scallops of the foliations of the hind tibiæ deeper and longer. A comparatively large species and recorded only from the south.

Leptoglossus phyllopus Linn.

Cimex phyllopus Linn., Syst. Nat., 1, 2, p. 731, 1767.

Anisoscelis albicinctus Say, Ent. of N. A., Vol. 1, p. 326, 1832.

Anisoscelis fraternus Westw., Hope Cat., ii, p. 16, 1842.

Anisoscelis confusus Dallas, List Hem. British Mus., ii, p. 453, 1852.

With *oppositus* Say this is one of the two most common species in the United States. It can be distinguished, however, from *oppositus* by having the lateral-posterior margins of the thorax crenulated and by the prominent yellow band across the elytra. In general form it is nearest to *zonatus* Dall. but the latter has a much larger hind femora while the femora of phyllopus is only normally swollen. The scallops in the foliation of the hind tibiæ are rather shallow and much shorter than in *zonatus*. Specimens have been examined from Virginia south to Florida and Texas.

THE LIFE-HISTORY OF *MESOVELIA MULSANTI* WHITE.

By H. B. Hungerford,
Cornell University, Ithaca, N. Y.

Among the most familiar inhabitants upon the surface of our ponds and quiet pools are the "skaters." These long-legged creatures that deport themselves with such ease and agility upon the surface of the waters have been noted by even the most casual observers. Their size and movements have forced at least a passing notice, but there are a number of small related species that escape all but those who look intently. Among these smaller forms is the little green *Mesovelia mulsanti*. It wears the brightest livery of them all, for the young and the apterous forms of the adults display varying degrees of green coloration, while the winged ones are even more conspicuous on the floating blankets of green algæ because of the silvery whiteness of their wings.

These insects measure only from four to five millimeters in length but are so distinct from other bugs in structure that they have been regarded as a distinct family.

At various times in the past they have been found in our collections associated with the *Hebridæ*, *Gerridæ*, *Hydrometridæ* and *Veliidæ* but at last have been segregated as the family *Mesoveliidæ*. The species here treated is the only one reported from the United States, but it is a widely distributed form.

It is at home in the haunts of the marsh-treader on the floating vegetation growing in the shallow waters of the pools, where the clumps of sedge spread their slender stems upon the water from the bordering bank, where young cat-tails spring up and green algæ carpet the surface of the waters.

Since they were first made known to science in 1852 by Mulsant and Rey, through the description of *Mesovelia furcata*, there has been added one other species, described by F. B. White (9)[1] from the Hemiptera collected in the Amazons by Prof. J. W. Trail and named *Mesovelia mulsanti.*

The information concerning the biology of these forms is meager and confined to a paper by Butler (2), 1893, on the "Habits of *Mesovelia furcata*," collecting notes on *M. furcata* by J. Scott (6) in England, and on *M. mulsanti* by Uhler (8) and by Bueno (1) in this country. It seems, therefore, worth while to present some notes concerning the biology of *Mesovelia mulsanti* whose habits and life-history are certainly among the most interesting of all the bugs that walk upon the surface of the inland waters.

They may be separated from the other bugs of the surface film by the following synoptic table prepared by Mr. H. M. Parshley:

A. Head as long as entire thorax; body and appendages extremely slender................................*Hydrometridæ*

AA. Head shorter than thorax; form stout or moderately elongate.
  B. Claws inserted at apex of last tarsal segment.
    C. Antennæ 5-segmented (except in *Merragata*); clavus membranous; membrane without veins.....*Hebridæ*
    CC. Antennæ 4-segmented.
      D. Membrane without veins; hind coxæ rotatory; color greenish; wingless form common *Mesoveliidæ*
      DD. Membrane with distinct veins forming elongate cells; hind coxæ hinged; color not greenish; wings more or less developed...........*Saldidæ*
  BB. Claws inserted before apex of last tarsal segment.
    C. Hind femora not extending much beyond apex of abdomen; middle pair of legs about equidistant from front and hind pairs (except in *Rhagovelia*) size usually minute...................................*Veliidæ*
    CC. Hind femora extending much beyond apex of abdomen; middle and hind pairs of legs approximated, very distant from front pair; size moderate, rarely minute...................................*Gerridæ*

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[1] See Bibliography.

HABITAT AND FOOD HABITS.

It has been indicated above that these little bugs live upon the floating vegetation of ponds. Butler (2) found them on Potamogeton and Bueno (1) on duck weed, matted Hydrodictyon or other algæ. The writer has found them about old logs projecting from the water—clumps of smartweed at the water's edge as well as on rafts of filamentous algæ and leaves and stems of plants procumbent upon the surface.

They were noted by Butler to be carnivorous in tastes. He fed them a variety of small insects and saw them feeding upon a springtail, (Smynthurus), a Crambus, a Chalcid and a Hydrometra and supposed the usual food to be small Diptera and Hymenoptera. As to whether they caught their prey alive or availed themselves of the drowned and disabled specimens he was unable to say. That *M. mulsanti* can live upon such fare is certain for the writer has reared them on flies and plant lice cast upon the water.

They are cautious creatures but do on occasion fall upon fairly lively prey, as evidenced by the following instance: A fly thrown into the aquarium was seen to crawl up the side of the jar bearing an adult female *Mesovelia* with its beak attached near the caudal end of the fly which when disturbed flew to a nearby support bearing the tenacious little bug.

However, the writer has come to believe that, with Hydrometra, Microvelia and Rheumatobates, they are not dependent upon the chance and uncertain fare of terrestial insects caught upon the surface film but find another, and indeed a more constant source in the organisms that dwell below but come up to the surface film. Among these, Ostracods and like forms are available as more or less staple food and Mesovelia have been observed exploring the sides of floating Typha and the tangled mats of algæ for such Crustacea which they spear from the surface of the water.

The tiny nymphs feed upon more gentle organisms in the water, as there are few upon the surface that they are able to overcome. When offered springtails as suggested by Butler, disaster often followed and the writer lost many good rearings before he learned the inadvisability of offering such food. The hungry little creatures would attack them only to be turned topsy-turvy upon the water even by comparatively small springtails. Plant lice afforded less risk of this kind and gave better results. They were used as the food supply in the isolation rearings where a study of molts was made. But in an aquarium twelve inches in diameter, the water of which contained algæ and floating sedge stems amongst which dwelt an abundant population of entomostracans, the little bugs were reared through their complete cycle without other resource than that afforded by the waters and the weaker of their own kind.

LIFE-HISTORY.

Technique in Rearing.

Butler states that "pairing took place several times and the bodies of the females became, by the end of three weeks, greatly distended." The specimens died, however, without ovipositing and his conclusion in regard to the matter, in the light of our present knowledge, seems amusing. It is only fair, however, to state that the writer had the same experience until he discovered that the female possesses an ovipositor for inserting her eggs into the tissues of plants. The newly hatched young were isolated in small stender dishes upon a very shallow film of water with a small bit of sedge stem for a support. The water was kept fresh and clean for the health of the bug and to facilitate finding the molt skins.

Oviposition.

Since Mesovelia hides and protects its eggs by burying them in the tissues of certain plants that are associated with shores and shallow waters the female possesses an ovipositor adapted to this purpose. If the female be examined in lateral view the abdomen is seen to be laterally compressed at its caudal end in such a manner as to provide a sheath or groove for the ovipositor (Pl. I, Fig. 13). A dissecting needle inserted near the distal and caudal end of this fissure can be used to pry out and bring to view a shiny brown chitinized organ which may be turned down into a position approximately at right angles to the body, for its attachment is at the basal end of the sheath. In this position it is seen to be curved so that the tip is directed slightly forward. The general shape, viewed from the front, is roughly spear shaped and the parts arranged in such a way that the front surface is concave forming a wide groove, reminding one, when in action, of the tip of an apple corer. Upon dissection it is seen to be made up of three parts, two lateral shafts that are strongly chitinized and toothed or serrated along the lower portion of their lateral margins and a broader central plate (see Pl. I, Figs. 14 and 15). The lateral shafts are attached to the flat plates of the abdominal wall. The central portion is in reality made up of paired parts attached to the median pair of sclerites that serve as the valves or shields for the ovipositor.

The manipulation of this instrument during oviposition may be observed any time during the spring, summer or autumn by confining a number of mating insects in a petrie dish containing only clear water and some food. After being thus deprived for a couple of days of materials in which to place their eggs they will gather about a small bit of sedge stem or cat tail leaf supplied them, and most eagerly set about the business of laying eggs. The writer has seen as many as eight thus employed about a portion of sedge stem one and one-half inches long and has had ample opportunity to watch the process under the binocular.

The female frequently explores the stem with the tips of her beak and antennæ if indifferent in the matter, but if eager to oviposit, she mounts the stem without delay, raises the abdomen slightly, unsheaths the ovipositor and turns its tip down to the surface of the stem. At times the surface is tested out at several points—again if the first point of contact is favorable, the tip is caused to quiver back and forth till it gains a footing, and then rocking the body slightly from side to side the entire drill is caused to rotate or twist back and forth on its axis—rapidly at times, or again more slowly as may suit the necessity of the work, until a hole is effected and the ovipositor is buried to its base. During the deeper drillings the longitudinal alternate thrusts of the drill parts are apparent. The first part of the operation at least involves much the same sort of a motion as one employs in making a hole with a gimlet or awl.[1]

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[1] In addition to the twisting motion and the alternate thrusts of the stylets there is yet another. It is the expanding or spreading of the drill parts during the enlarging or reaming out of the hole.

It takes but a moment in the spongy water-soaked stem of a sedge to drive the instrument up to its base. Then, after a moment of apparent quiet, the ovipositor is lifted slightly and the egg is forced by a series of abdominal contractions down the ovipositor and into the cavity reamed out to receive it.

The egg when forced into the ovipositor distends it considerably as it passes through its channel and thus can be seen to slip down into position with its distal end directed forward beneath the insect. The ovipositor being at last withdrawn from beneath, the egg slips out from behind the exposed circular end of it.

A number of eggs may be imbedded thus, in the stem before the ovipositor is sheathed—each one requiring a separate puncture. In the cylindrical stems of plants procumbent upon the water the eggs are likely to be inserted on the sides as they come in contact with the surface film, but this is by no means necessarily the case.

As frequently as not the male accompanies the female during the process. Having mounted her in mating he merely moves forward and remains perched upon her back as she busies herself with egg laying, mating being attempted and often consummated between her labors. [1]

In starting the drill in a particularly stubborn or inconvenient place the female not infrequently uses one of her hind legs to steady and stiffen or support the drill. One female after making several attempts employed her right hind leg in such a manner that the tarsus was turned at an angle with the tibia and the angle thus formed used to direct and aid the ovipositor.

During the process of oviposition the female often defends herself from molestation by kicking vigorously with the hind legs when disturbed.

Description of Egg.

Size: Length .875 mm.; greatest diameter .187 mm. to .250 mm.; diameter of exposed circle .15 mm.

Shape: This shape is best shown in the drawing. The egg is elongate oval with a curved neck terminating in a flat surface which marks the exposed end of the egg as it lies *in situ* in the stem of some plant.

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[1] In mating the male mounts the female—clasps his fore legs around her mesothorax in front of her middle legs—rests his middle legs upon the water film or other supporting surface and holds the hind legs poised in the air. The copulatory organ of the male is long and curves around the side of the tip of the female's body to come into contact with the genital opening. Contact lasts from a few seconds to one minute or longer. Upon withdrawal the copulatory organ is seen to be a slender white tube of astonishing length.

Color: When first laid, white; in the course of two or three days it has become watery transparent with portions of the embryo beginning to take form. These eggs buried singly as indicated above are shown in the drawings (Pl. I, Figs. 5 and 7). The exposed end of the egg shows up as a shiny membranous circular spot on the surface of the plant which bears it and is visible to the naked eye. This spot, though clear white when first laid presents at about the second day a very faint ring of pink which darkens to a deep pink after twenty-four hours. In the course of another day or two this gradually fades and two days before hatching the deep red eye spots may be seen through clear stems in the position shown in Fig. 7.

The egg stage lasts seven to nine days. At hatching the young nymphs, still enclosed in their embryonic membrane, work their way up through the little circular openings of the stem. This is a remarkable feat considering the size of the nymph and the size of the hole but is aided materially by the peculiar backward pointed pegs on the thin embryonic membrane. When well out of the stem this membrane is cast and the nymph takes its place upon the water.

First Instar.

Size: See the table presented below.

Color: When first hatched it is white with red eyes darkening to amber and green as it ages. To the unaided eye it is greenish brown. Thus it is much darker than the older nymphs, quite distinct in coloring. The tips of the appendages are dark while the limbs themselves are pale.

Structural Peculiarities.—The general form is stouter and more robust than that of the later stages. The body and limbs are clothed with hairs and bristles as shown in the Fig. 4. The head and thorax bear a few stout bristles and the antennæ bear on the first segment several (usually 3 or 4) stout bristles directed mesally and the terminal segment is thickly covered with fine hairs. The limbs, besides bearing many hairs possess a number of black bristles arranged as follows: One stout bristle is prominent near the distal end on the anterior margin of the meso- and meta-thoracic femura. The metathoracic tibia are beset with numerous irregularity arranged bristles. Terminating with one larger than the others.

The antennæ are stout and as long as the body, four segmented, the terminal segment is somewhat broadened and as long as the other three. The head bears no indication of ocelli but does possess the black bristles indicated in the later instars.

The limbs are stout, the tarsi one-segmented and ending in two claws.

The abdomen bears a dorsal pore on the median line of the dorsum of the fourth abdominal segment.

Later Instars.

The second and later instars are bright green in color and more slender in form. They possess relatively fewer hairs on the body—but retain the black bristles in the positions indicated in the first instar. There appear in these later instars one black bristle on anterior margin of fore femur and two on the other femora. The structural characters remain constant until the adult stage is reached when the following changes become apparent.

The first antennal segment possesses but one black bristle instead of a number of them (usually).

The limbs are more slender and tarsi 3-segmented.

The connexivium is broad and the sexual characteristics appear.

In the winged female there appear two dark ocelli-like spots on the vertex.

The winged forms are often found with membrane missing. They have been observed to break away this portion of the wing with the hind tibia, exposing the tip of the abdomen as shown in Fig. 1.[1]

Following is given a table of measurements of the various instars and of the adults:

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[1] Mr. J. R. de la Torre Bueno describes this habit in Halobatinæ. Canadian Ent., Vol. IX, No. 1, p. 389 (1908)

TABLE OF MEASUREMENTS IN MILLIMETERS OF INSTARS OF MESOVELIA MULSANTI.

Stage.	Measurement from tip of femur to tip of femur.	Antennæ.				Hind leg.			Middle leg.			Fore leg.		
		1st seg.	2d seg.	3d seg.	4th seg.	Femur.	Tibia.	Tarsi.	Femur.	Tibia.	Tarsi.	Femur.	Tibia.	Tarsi.
1st instar....	1.	.149	099	.11	.416	.416	.573	.211	.336	.306	.166	.25	.213	.129
2d "	1.25	20	.125	20	.5	.54	.625	.225	.35	343	.188	.312	.26	.135
3d "	1.5	.25	.166	.207	54	.625	85	.275	.437	.44	.225	.375	33	.167
4th "	2.125	.29	.21	.32	75	.81	1.	.375	.625	.625	.29	.5	.38	.25
5th "	2.5	.375	.29	.375	.81	1.03	1.37	.437	.75	.75	.375	.625	.50	.26
6th ♂.......	....	.65	.416	.716	.96	1.35	1.56	.5	1.09	1.09	.416	.858	.75	.26
6th ♀.......	....	.59	.39	.65	.79	1.56	1.95	.65	1.17	1.17	.52	.91	.78	.312

Before attaining the adult stage, the nymph passes through five nymphal instars spending from two to three days in each stage. Mating occurs and oviposition begins about the third day. One female emerged August 1, began to lay August 3 and died August 12, having laid 44 eggs an average of nearly 5 eggs per day. Some of the females in isolation laid an average of less than this, while one female under observation laid 18 eggs in 24 hours, a surprisingly large number, when we consider the size of egg and adult. The table presented on p. 82 is the history of one of a number of series, of isolation rearings, and indicates the variations in the duration of the different stages. The record of the many that died after isolation is omitted. It represents at least 90 per cent. of the total for mortality is very heavy under laboratory conditions. However, rearing in isolation and in close confinement is the only way to arrive at the number of molts and duration of instars. When a number are reared together the close resemblance of the instars and the variation in size within a given instar makes precise observation impossible. The writer has endeavored to determine diagnostic characters for the various instars. In the apterous forms he has found the spread from tip of femur to tip of femur the only fairly satisfactory determination (see table above). The developing winged forms beginning with the third instar are readily placed. (See Fig. 3 for the size of the wing pads in the 5th instar.)

MESOVELIA MULSANTI—A HISTORY OF A FEW ISOLATED REARINGS.

Exp. No.	Lot. No.	Egg laid.	Egg hatched.	1st molt.	2d molt.	3d molt.	4th molt.	5th molt.	Mated.	Eggs laid.	No. of eggs.	Died.
1685	1643	7/ 5/16	7/13/16	7/18/16	7/19/16	7/22/16	7/24/16	7/27/16	7/29/16	7/30/16	26	8/ 5/16
1643	1643	7/ 5/16	7/13/16	7/16/16	7/19/16	7/22/16	7/24/16	7/26/16	♂	...?..	....	7/30/16
1688	1643	7/ 5/16	7/13/16	7/15/16	7/16/16	7/19/16	7/22/16	7/25/16	♀	7/28/16	15	8/ 2/16
16142	1657	7/13/16	7/21/16	7/23/16	7/25/16	7/27/16	7/29/16	8/ 1/16	♀	8/ 4/16	21	8/ 9/16
16x	....	7/24/16	8/-1/16	8/ 3/16	8/ 6/16	8/ 8/16	8/11/16	8/14/16	♂	....	....	8/22/16
16y	....	7/13/16	7/21/16	7/23/16	7/25/16	7/27/16	7/29/16	8/ 1/16	♂	....	....	8/ 7/16
1657	1657	7/13/16	7/19/16	7/21/16	7/23/16	7/26/16	7/29/16	7/31/16	♀	....	....	7/31/16
16571	1657	7/13/16	7/20/16	7/22/16	7/24/16	7/26/16	7/29/16	8/ 1/16	8/ 4/16	8/ 9/16	10	8/ 6/16
16197	....	7/13/16	7/20/16	7/22/16	7/25/16	7/27/16	7/29/16	8/ 1/16	8/ 3/16	8/ 4/16	44	8/12/16

SUMMARY.

Mesovelia mulsanti is found about the margins of ponds and pools upon floating vegetation where it feeds upon small organisms coming to the surface film from below or that fall upon it. The species probably passes the winter as adults that begin ovipositing in the spring. They place their eggs in the stems of plants and even in the spongy wood of floating logs.[1] There is a succession of generations throughout the season, each cycle requiring about twenty-four days. Winged and wingless forms occur together. Besides flying from pool to pool, they may be transferred in the egg stage. Mr. Beamer sent them from the southern part of the state to the writer at Lawrence, Kans., in the stems of sedge used as packing for some Naucorids.

The general distribution of this species, and the ease with which it may be controlled and observed both as to oviposition and to hatching, make it a valuable object for studies on these phases of animal behavior.

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[1] Since this paper was submitted for publication the writer has learned from Mr. J. R. de la Torre Bueno that he found the eggs of these bugs in plants some years ago. This gives him priority of observation on this point.

Explanation of Plate.

Fig. 1. Mesovelia mulsanti, winged male with membrane of wings broken off.

Fig. 2. Mesovelia mulsanti, winged female, wings entire.

Fig. 3. Fifth instar nymph; note the dorsal pore on fourth abdominal segment.

Fig. 4. First instar nymph.

Fig. 5. Eggs in stem of sedge, surface view of the two at left. The other two seen in situ in stem when portion of stem is removed.

Fig. 6. Fourth instar apterous form.

Fig. 7. Two eggs, showing their connection with surface of stem; eye spot shows in the one to the right.

Fig. 8. The embryonic membrane, cast by the hatching nymph; 2 "pegs" shown at the left enlarged.

Fig. 9. Apterous male.

Fig. 10. Apterous female.

Fig. 11. Male genitalia from above.

Fig. 12. Male genitalia from side, hooks in black.

Fig. 13. Ventral view of female ovipositor in its sheath.

Fig. 14. Ovipositor, lateral shafts shaded. They slide up and down on the central shaft.

Fig. 15. Cephalic view of ovipositor, turned into position for action.

Drawings 1, 2, 4, 9, and 10, by Miss Ellen Edmonson.

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NOTES ON APHIDS.

By G. O. Shinji,
Berkeley, California.

Nectarosiphum rubicola Oestl., with description of the male.

Alate viviparous female. General color, pale or green. Length of body, 3.8 mm. Width of abdomen, 1.6 mm. Wing expansion, 4.3 mm. Head, pale or green, broader than long, width between the eyes, .45 mm. Beak, reaching second coxa, near the tip dusky. Antenna situated on frontal tubercle, pale except dusky rings at the distal end of III, IV and V, VI including spur dusky, length of articles: III, 1.1 mm.; IV, .7 mm.; V, .55 mm.; VI, .3 mm.; spur, 8 mm. Sensoria about 14 on III, one each on IV and V. Prothorax wider than long, width, .6 mm., pale. Mesothorax slightly dusky, border with muscle lobes amber, width, 1 mm. Metathorax slightly dusky. Legs, distal one fifth the length of tibia and entire tarsi dusky, rest pale. Abdomen, pale, inflated. Cornicles mostly dusky, often basal half pale, length, 1 mm. Cauda, pale. Wings hyaline with smoky area near the tips of forewings, expansion: forewing, 4.9 mm., hind wing, 2.7 mm.

Apterous viviparous female. General color, pale or green. Length of body, 2.7 mm. Width of abdomen, 13 mm. Head, pale, broader than long. Beak reaches to third coxa, pale except apical half of third joint which is dusky. Length of antennal joint: III, .9 mm.; IV, .6 mm.; V, .55 mm.; VI, .2 mm.; spur, 1 mm. Prothorax, pale. Thorax and abdomen, pale. Tibia dusky. Rest of legs color of the body. Cornicle, dark, slightly swollen as in alate form, 1.2 mm. long. Cauda, pale, longer than wide at base.

Host plant: Thimbleberry.

Locality: University of California campus, Berkeley, Calif.

Date of collection: March 20, 1915.

Male (*alate*): Alate, wing venation as in the alate viviparous female. General color, rosy. Body small, length, 1.6 mm., width of abdomen, .5 mm. Head black or at least dusky, broader than long, length, .3 mm. between the eyes. Rostrum beyond the third coxa. Eyes black, large. Antenna black except lighter base of III. Length of joints, III, 1.1 mm.; IV, .8 mm.; V, .7 mm.; VI, .3 mm.; spur, 1.2 mm. Sensoria on antennal joints distributed as follows: III, 5; IV, 15; V, 15. Cornicles, black, .6 mm. long. Style dusky, small. Mesathorax black, length, .5 mm. Metathorax, black. Abdomen cylindrical, not much inflated, rosy or light red.

Anteroventrally to the cauda there is a pair of somewhat horny cerci.

Host plant: Thimbleberry (*Rubus parviflorus* Nutt.).

Locality: University of California campus, Berkeley, Calif.

Date of collection: April 4, 1915.

NOTES.—So far as my knowledge goes, *N. rubi* is one of the earliest male producers, the other being *Myzus ribis.* Although I have never studied the life history of this particular species, I had the opportunity of observing the emergence of stem-mothers from their eggs about the twentieth of February. The males were found only on the underside of already tinged leaves, while parthenogenetic forms were infesting terminal shoots and green, tender leaves. Not a single specimen of oviparous female or of egg could be found on the same or nearby plants at the time when males were abundant. Although the male of this species can be distinguished from its sisters by smaller size, darker coloration, numerous antennal sensoria, presence of paired cerci, etc., the only character common to the males of all Aphids, it must be mentioned, is the presence of cerci. To illustrate, the males of *Aphis pomi* are alate, and lighter than the alate viviparous form. The males of *Rhopalosiphum lactucae* are as large as the alate viviparous females. Again, the males of *Calaphis betuloecolens* have the same number of antennal sensoria as the alate sisters.

Chaitophorus coleoptis sp. nov.

Alate viviparous female. Body small, length including cauda, 1.4 mm. Width of abdomen, .7 mm. Wing expansion, 2.3 mm. Head broader than long, slightly narrower than prothorax, width including eyes, .45 mm., dusky. Beak reaching to second coxa, tip dusky. Antenna arising from side of head, six articled, third joint subequal to spur, apical half of fifth together with sixth including filament dusky, rest the color of the body. Length of articles: III, .4 mm.; IV, .23 mm.; V, .2 mm.; VI, .1 mm.; filament, .4 mm. Eyes dark red. Prothorax dusky, very short, width, .47 mm. Mesothorax dusky, width, .65 mm. Metathorax dusky. Front leg pale except tarsi which is dusky, middle and hind legs of the color of body with femora and tarsi dusky. Length of femora: front, .25 mm.; middle, .35 mm.; hind, .45 mm. Length of tibia: front, .35 mm.; middle, .50 mm.; hind, .75 mm. Abdomen, pale with a large middle dorsal patch of dusky or several transverse dusky bands, and also marginal dusky patch, somewhat hairy. Cornicles pale, constricted about the middle, slightly longer than wide at base. Style dusky, rounded at tip and constricted at base, provided with long spines. Anal plate pale, apex nearly straight, but a little curved in, never rounded nor much indented. Wings small, usually normal in venation, often one of the two varies in venation but cases in which both right and left wings are abnormal is rare.

Apterous viviparous female. Body with spines, pale, small, length, 1.45 mm. Width of abdomen, .9 mm. Head the color of body. Eyes dark red. Antenna arising from side of head; sixth including spur and apical half of fifth dusky, the rest color of head, length of articles: III, .4 mm.; IV, .23 mm.; V, .2 mm.; VI, .1 mm.; spur, .4 mm. Thorax and abdomen compressed, hairy, pale. Legs pale, except dusky tarsal joints. Cornicles pale, shape as in alate form, style, with spines, pale, anal plate as in alate.

Host plant: Abies balsami.

Locality: San Francisco.

Date of collection: April 10, 1915.

AN INTERESTING MANUSCRIPT.

BY L. O. HOWARD.

At a meeting of the Biological Society of Washington, held March 10, 1917, Dr. Hugh M. Smith, chief of the United States Bureau of Fisheries, exhibited a packet of 283 loose sheets, each sixteen and five-tenths centimeters by ten centimeters, backed by pasteboard covers and labeled in manuscript, "Olivier's North American Coleoptera, 283 plates." Below this legend is dimly written in pencil by a different hand, "Painted by Mrs. C. L. H.—, wife of Professor C. L. Hentz, bgt. November 2, 185—." Dr. Smith, after exhibiting the packet, presented it to the writer, calling attention to a newspaper clipping which he had found under the cover from the *Boston Transcript* of November 21, 1856, giving a notice of the death of Prof. N. M. Hentz at the residence of his son, Dr. Charles A. Hentz, at Mariana, Fla., on the fifth instant (*i. e.*, November, 1856), followed by a brief obituary notice. Dr. Smith further stated that this packet had been bought by his father at a book sale very many years ago.

On careful examination it seems obvious that this collection of loose leaves constitutes a selection of all the North American species of Coleoptera from the six volumes of A. G. Olivier's "Entomologie, ou Histoire Naturelle des Insectes Coleopteres." Obtaining access to a copy of Olivier's great work, Prof. Nicholas Marcellus Hentz had evidently asked his talented wife, Caroline Lee Hentz, to copy the colored illustrations and descriptions of all of the species described from North America. Or possibly he did the drawing and she copied the descriptions.

Hentz, before his marriage, had lived at Boston and Philadelphia, moving south shortly after marriage in 1824. Olivier's work may have been loaned to him from Philadelphia or from Boston, as he was frequently in correspondence with T. W. Harris.

In the correspondence, as published in "The Entomological Correspondence of Thaddeus William Harris, M. D.," printed by the Boston Society of Natural History, in 1896, there is no reference to the loan of Olivier, but the last letter published was Harris to Hentz, November 6, 1839, and the manuscript copy was probably made later than that date.

On comparison of these loose leaves with the copy of Oliver in the Library of the Bureau of Entomology the Hentz illustrations prove to be very faithful copies, a little lighter in color as a rule, but with the added effort in some cases of indicating high lights on dark species, which improved their general appearance as compared with the copy of the printed work in Washington. In a few cases the colors are not completely worked in.

In the copies of the descriptions useless words are omitted. For example, should the original read, "Les antennes sont noires," Mrs. Hentz would simply write "Antennes noires." But no useful descriptive word is omitted. The enormous amount of copying that Harris, Fitch and other early entomologists had to do in the absence of funds for the purchase of rare works is a matter of frequent record. It is doubtful, however, if there exists a more perfect and useful manuscript than the one just described. It will be extremely useful, even today, since it brings together in compact form only the North American species described and figured by Olivier. It will be deposited either in the Library of the United States National Museum or in that of the Bureau of Entomology, where it may be consulted.

THE NORTH AMERICAN SPECIES OF *PACHYNEURON* WITH THREE NEW SPECIES (CHALCID-FLIES).

By A. A. Girault,
Bureau of Entomology, Washington, D. C.

Based on the types (except *albutius*). Females.

I. Legs yellow except the coxæ (compare *anthomyiæ*).
  Scapeblackish. (Is a *Dibrachys*.) *nigrocyaneum* Norton
  Scape yellow. As in *anthomyiæ* (of which it is a probable variant). Median carina of propodeum sometimes single (the abdominal petiole not strongly striate). (=*syrphi* Ashmead) (=*syrphicola* Ashmead.) .... *albutius* Walker

II. Legs with at least the coxæ and femora concolorous or the latter darkened. Spiracular sulcus narrow, distinct, no lateral carina. Mandibles 4 = dentate. Clypeal projection with a tooth on each side of its base.

Abdominal petiole over twice longer than wide, scaly. Neck of propodeum conspicuous; clypeus with its projection with a concave distal margin. Coxæ and femora submetallic. Scape yellow. Median carina of propodeum obsolete.....*altiscuta* Howard

Abdominal petiole only a little longer than wide. Clypeal projection truncate or subtruncate.

Coxæ metallic, femora washed with metallic.

Scape pale.

Propodeum with a more or less complete (paired and diverging) median carina which is somewhat like a ruga and rather delicate, variable. Funicle joints all short, somewhat variable. Abdominal petiole scaly. (= *allograptæ* Ashm.)
anthomyiæ Howard

The same. Propodeum with single median and lateral carinæ, the latter more or less obscure and paired at base; petiole with strong longitudinal striæ. Scutellum with a distinct cross-suture before apex. Segment 2 of abdomen caudad at meson faintly emarginate....*hammari* Crawford

The same but scutellum without a distinct cross-suture before apex (only a faint obscure ridge in its place as in other species), segment 2 of abdomen is sharply minutely incised caudad at mesón (as in the other species), the spiracular sulcus is twice broader while the median and lateral carinæ of the propodeum are more delicate
virginicum sp. nov.

Scape with the distal half metallic.

The same as *hammari* but the cross-suture of the scutellum is indicated by coarser punctures, distad of its site, the caudal margin of segment 2 of the abdomen is convex, entire, the median carina of the propodeum is represented by several interlacing, delicate rugæ broadly across the meson while the tibiæ are dark except at each end or reddish brown......................*texanum* sp. nov.

Scape wholly metallic except at the extreme base of its body; the bulla metallic.

Propodeum as in *Propachyneuronia siphonophoræ* Ashmead (plane with a neck and spiracular sulcus). Scutellum with no indication of a cross-suture; segment 2 of abdomen slightly emarginate at meson caudad, convex there. Petiole subquadrate, finely scaly. Funicle 1 somewhat the smallest..................*californicum* sp. nov.

Pachyneuron virginicum Girault.

Female: Like *hammeri* Crawford except as pointed out above. The male is the same except that the funicle joints are considerably longer, 1 twice longer than wide.

From a pair reared from wingless, viviparous females of *Aphis sorbi* Kaltenbach on apple. Blacksburg, Virginia, August, 1915 (M. T. Smulyan).

Types: Catalogue No. 20368, U. S. N. M., the pair on tags, the male head and caudal tibia on a slide.

Pachyneuron texanum Girault.

The types are three females reared at College Station, Texas, in February, 1891, from wheat (F. M. Webster). Catalogue No. 20369, U. S. N. M., the examples on tags, a head and a caudal tibia on a slide.

Pachyneuron californicum Girault.

The males have the legs white except the coxæ and the proximal half of the caudal femur; the scape is nearly wholly whitish, the funicle more hairy, with joints 1–2 subequal and over twice longer than wide. The types and cotypes are three pairs on tags with a slide bearing a female head and caudal leg. Mt. Antonio, Calif., 6,000 feet, July 20, 1911, and Carpenteria, Calif., August 17, 1911 (P. H. Timberlake). Catalogue No. 20370, U. S. N. M., two pairs on tags (Mt. Antonio) and the slide.

NEW MISCELLANEOUS CHALCID-FLIES FROM NORTH AMERICA.

By A. A. Girault.
Bureau of Entomology, Washington, D. C.

Pseudiglyphomyia marilandica sp. nov.

Female: Length, 1.00 mm. Very similar to *nigrivariegata* Girault but somewhat smaller and differing also in the following particulars: The general color is orange; the face of prothorax has a black stripe across it; cephalic margin of scutum rather broadly black; the parapsidal furrows and the suture between scutum and scutellum are more noticeably black; also black thus—there is a moderately large round spot in the center of the scutellum; the spot on the axillæ is more distinct; the cephalic margin of the propodeum narrowly out a little laterad of the spiracle and an oblique stripe from base between meson and spiracle, extending well toward apex; and seven narrow cross-stripes on dorsal abdomen from base to apex, the first broadly interrupted at the meson. Prothorax lemon yellow. Tegulæ dusky, also the antennæ, the scape paler except on dorsal edge and toward the apex. Mandibles 6-dentate. Funicle joints subequal, each twice longer than wide and longer than the pedicel; club 1 nearly as long as funicle 1, longest, 3 with a distinct terminal spicule. The propodeum is as in *nigrivariegata* but there is no very narrow lateral carina directly from the minute round spiracle which is not very close to the cephalic margin. Types compared.

One female, open woods, Glenndale, Md. (September 28, 1916).

Type: Catalogue No. 20622, U. S. National Museum, the female on a tag, the head and the hind tibiæ on a slide.

Euplectrus platypenæ Howard.

Reared from a larva on grass, Barbados, B. W. I., January, 1915 (F. Watts).

Gonatocerus illinoiensis sp. nov.

Female: Similar to the description of *juvator* Perkins but the legs are yellow except all tibiæ and tarsi besides the prothorax, lateral and caudal margins of scutum and the parapsides except apex (cephalad). Fore wings subhyaline. Middle and hind coxæ black. A most beautiful species when alive.

One female, window of a laundry, Coulterville, Ill., June 10, 1911.

Type: Catalogue No. 20631, U. S. National Museum, the female on a slide.

Neomphaloides cincinnatus sp. nov.

Female: Length, 1.20 mm. Slender, the stylus a little shorter than the ovipositor and a third of the abdomen's length.

Dark metallic blue, the wings hyaline, the venation and scape pale, the tarsi, knees, cephalic and middle tibiæ and the caudal legs except the coxæ golden yellow. Abdomen above and below with a large peltate spot of golden yellow at base (base and lateral margin narrowly concolorous, the yellow reaching to apex of basal third) and with over the basal half of the stylate part golden yellow. Pedicel but somewhat longer than wide, about half the length of funicle 1, the latter slightly longest, thrice or more longer than wide, the club joints twice longer than wide, the third with a distinct but not elongate terminal spine. Mandible tridentate, the third tooth obliquely truncate. Stylus hairy. Punctures along lateral margin of scutum very delicate, obscure. Sculpture usual but the propodeum rather coarsely scaly, with a narrow median carina and a similar, straight lateral one, the spiracle minute, round, halfway between middle and cephalic margin.

One female, woods, Glenndale, Md., September 9, 1916.

Type: Catalogue No. 20472, U. S. National Museum, the female on a tag, the head on a slide.

A second female, same place, some days later.

Dibrachys clisiocampæ (Fitch).

Four females reared from the larvæ of *Phthorimœa operculella*, Pasadena, Calif. (J. E. Graf).

Polynema bifasciatipenne (Girault) **varium** var. nov.

Female: Differing from the typical form in being light yellowish brown, including the legs; distal stripe of fore wing nearly as long (or even longer) as the middle one and subrectangular, its apical margin flatly convexed, its basal nearly straight. Ovipositor black except at base, more extruded (for a length equal to a third of that of the abdomen's body or nearly as long as the slenderer petiole). And the hind wings are wholly hyaline.

The male has a fuscous band across the abdomen a little before apex.

One male, three females described in detail in Journ. New York Ent. Soc., December, 1910, pp. 254–258. Locality, *Fredonia*, Kans.; eggs of *Œcanthus*.

Types: Catalogue No. 20599, U. S. National Museum, one male, three females on tags.

Anaphoidea conotracheli (Girault).

From eggs of *Craponius inæqualis*, West Virginia (F. E. Brooks).

Eutelus betulæ sp. nov.

Female: Length, 1.00 mm. Dark metallic green, the wings hyaline, the scape, most of the pedicel, venation, cephalic tibiæ, tips of other tibiæ and the tarsi, yellowish brown. Body finely scaly punctate, the propodeum and abdomen scaly, the former tricarinate but the median carina weak, subobsolete. Parapsidal furrows incomplete. Propodeal spiracle minute, rounded, its own diameter from the cephalic margin. No spiracular sulcus. Abdomen conic-ovate, a little longer than the rest of the body, depressed or sunken above, its second segment occupying a fourth of the surface. Lateral ocelli far distant from the eyes. Clypeus small, not advanced, sharply incised at the meson, thus bidentate, its teeth obtuse. Mandibles 3- and 4-dentate. Antennæ inserted near the clypeus, a little below the ventral ends of the eyes, 13-jointed with three ring-joints, the third of the latter largest; funicle joints subquadrate, subequal, somewhat shorter than the pedicel. Stigmal vein a half shorter than the marginal, somewhat shorter than the postmarginal.

The male is similar but the abdomen is much shorter, depressed and obtuse at apex.

From two pairs reared from "*Cecidomyiia betulæ*, Albany, N. Y., June 10, 1887 (J. A. Lintner)."

Types: Catalogue No. 20789, U. S. National Museum, two pairs on tags, appendages on a slide.

Eutelus salicis sp. nov.

Female: Length, 2.15 mm. Like the preceding but much larger, the pedicel is entirely reddish yellow and larger (also the first two ring-joints; funicle 1 is about twice longer than wide), the femora reddish yellow; the clypeus is not incised but broadly sinuate or concaved; the abdomen is longer and stylate, not sunken, the antennæ inserted barely below the ventral ends of the eyes; the propodeum is about as in *Habrocytus onerati* and the marginal vein is somewhat larger. Differs from *H. onerati* (Fitch) mostly in that the flagellum is black, the antennæ with three ring-joints and somewhat lower on the face.

From three females reared from a conical Cecidomyid gall on *Salix longifolia*, Melrose, Mass., January 20, 1882 (U. S. Department Agriculture).

Types: Catalogue No. 20788, U. S. National Museum, the three females, minutien-mounted and a slide bearing caudal tibiæ and a head.

Achrysocharella pulchrella sp. nov.

Female: Length, 1.00 mm. Bright orange yellow, the abdomen somewhat paler, the wings hyaline, the body marked with dark metallic blue as follows: Pronotum, cephalic half of scutum, a dot on each side, center of occiput, a tolerably broad stripe across the base of the abdomen, followed immediately by a narrow cross-stripe and then at intervals equal to the basal stripe (except in the first instance) by four sometimes thicker cross-stripes, the last one of which is at base of distal third. Legs, scape and pedicel, white, the funicle and club dusky. Tip of ovipositor valves black. Head and thorax very finely punctate, the propodeum and abdomen scaly. Propodeum plane, with a median carina and a oblique carina just laterad of the rounded spiracle. Scutellum with a seta on each side of the middle, somewhat flattened. Postmarginal vein shorter than the stigmal. Terminal spine of the club as long as its joint; pedicel, funicles 1–2 and club 1 subequal, twice longer than wide; club 2 somewhat shorter, 3 still shorter. Club narrowing distad. Mandibles with two acute outer teeth and a third inner which is rather broadly truncate at apex and there with minute teeth. Parapsidal furrows barely indicated cephalad. Habitus of the Australia *grandis*.

From one female in the U. S. National Museum Collection from the District of Columbia.

Type: Catalogue No. 20438, U. S. National Museum, the female on a card, the head on a slide.

Atoposomoidea ogimæ Howard. Genotype.

Same as *Diaulinopsis* but postmarginal abbreviated. Head normal.

Grotiusomyia flavicornis sp. nov.

Female: Length, 1.20 mm. Aeneus black, the wings hyaline, the legs (except the coxæ and femora) and the antennæ, straw yellow. Pedicel dusky. Head and thorax finely scaly punctate, the abdomen scaly except segment 2 which is glabrous (except at apex). Postscutellum and propodeum subglabrous, the latter with a strong median carina and a curved smooth sulcus in the site of the lateral carina, the mesal margin of which is an obtuse carina; spiracle elliptical, of moderate size, cephalad. Parapsidal furrows complete, fine like lines. Pronotum transverse-quadrate, over half the length of the scutum. Segment 2 of abdomen much the largest, occupying a third of the surface, its caudal margin straight. Axillæ considerably advanced. Marginal vein as long as the submarginal, over twice the length of the long stigmal, the latter distinctly shorter than the postmarginal. Mandibles 6=and 7=dentate. Club 2=jointed, nippleless, the joints about equal in length, 1 a little wider than long. Pedicel somewhat longer than wide, the funicle joints shortening and widening, 1 slightly shorter than the pedicel, the others wider than long. Antennæ clavate. Femora usually yellow except the caudal ones.

From six females reared from an oak pyralid, Washington, D. C.

Types: Catalogue No. 20695, U. S. National Museum, the females on tags (1 minutien), a head and four caudal legs on a slide.

Aphidencyrtus aspidioti Girault.

A pair from *Lepidosaphes ulmi*, Monmouth, Me., July 22, 1914 (E. H. Siegler). The male bears two ring-like funicle joints and a very long, solid club, the antennæ 5=jointed.

Lamprostatus canadensis sp. nov.

Female: Length, 2.45 mm. Stout. Dark metallic green, the wings hyaline, the venation dusky yellow, the tibiæ and tarsi reddish brown. Head and thorax densely scaly, the scutellum with a deep, foveate cross-suture before its apex and at base with a short median sulcus and row of small punctures along its lateral margin; propodeum with a median carina (and no others) from which run more or less distinct oblique rugæ; also a lateral carina distad only, the spiracle moderately large, ovate. Petiole wider than long, the second abdominal segment occupying not quite half of the surface, its caudal margin straight but with a short slit at the meson. Antennæ inserted a little below the middle of the face, above the ventral ends of the eyes; clypeus not advanced but at each end with a stout tooth and another in the middle (of its ventral margin); an obtuse ridge from the clypeus to the antennæ along the meson. Parapsidal furrows deep, distinct. Suture between pronotum and scutum distinct. Antennae 13=jointed with two ring-joints, the club wider than the funicle but not half its length; funicle 1 a third longer than wide, 6 quadrate, longer than the pedicel. Scape not long. Postmarginal vein longer than the marginal, the stigmal long, a little shorter than the marginal. Abdomen flat above, much keeled beneath, smaller than the thorax. Mandibles 3=and 4=dentate.

Described from one female in the U. S. National Museum from Banff Springs, Alberta, Can. (E. A. Schwarz).

Type: Catalogue No. 20429, U. S. National Museum, the specimens on a tag, the head, caudal legs and a fore wing on a slide.

Miscogaster flora sp. nov.

Female: Length, 2.10 mm. Like *abnormicolor* but only the caudal tibiae are purple and the blotch on the fore wing does not form a crescent but is a large, oblique marking from the apex of the stigmal vein, its sharp end caudo-proximad; the clypeus is somewhat more produced. Funicle 5=jointed.

From two females, Jacksonville, Fla. (Ashmead).

Types: Catalogue No. 20790 U. S. National Museum, the specimens on tags, a head, fore wing and caudal tibiæ on a slide.

Miscogaster biguttata sp. nov.

Female: Length, 2.25 mm. Similar to *flora* but the legs all white, the fore wings bear two small, rounded spots, one at the apex of the stigmal vein, the other, larger and somewhat quadrate, at the base of the marginal vein. In some males, the proximal spot is absent and there is a narrow, yellow cross-stripe at about apex of proximal fourth. Antennæ nearly all yellow.

From five males, one female with *flora*.

Types: Catalogue No. 20791, U. S. National Museum, the specimens on tags.

Megorismus poloni sp. nov.

Female: A third smaller than *lasiopteræ* Ashmead and differing from that species notably in having the antennæ wholly concolorous except the bulla; also, as follows: the antennæ are inserted somewhat farther ventrad, on a level with the ventral ends of the eyes; the clypeus is stoutly bidentate at the apical meson instead of unidentate, as in the other species; the propodeum is subglabrous and though tricarinate there is not a cross-carina consisting of three rugæ which converge at the meson from each side. Segment 2 of abdomen occupying nearly a half of the surface; its caudal margin at meson with a short slit. Lateral carina of propodeum failing just before the cephalic margin. Postmarginal vein more or less subequal to the marginal, longer than the slender stigmal. Prothorax distinct. Parapsidal furrows complete, shallow. Scutellum with a shallow cross-suture before the apex. Petiole of abdomen quadrate, reticulate, the abdomen conic-ovate, pointed ventrad, about as long as the thorax. Antennæ 13-jointed with two ring-joints; funicle 1 a little longer than wide, much shorter than the subelongate pedicel; funicles 2–4 subequal to 1, 6 quadrate. Scape long and slender. Tibiæ at each end yellowish brown. Mandibles 4-dentate.

Described from four females from Placer County, California, August (U. S. National Museum).

Types: Catalogue No. 20792, U. S. National Museum, the specimens, minutien-mounted and a slide bearing a head and caudal tibiæ.

In the species *lasiopteræ*, segment 2 of the abdomen is shorter than in *poloni* and its caudal margin is entire.

Trydymus æneicornis sp. nov.

Female: Half the size of *robiniæcola* Ashmead and differing farther in having the antennæ wholly metallic green and also the legs except knees, tips of tibiæ and tarsi; otherwise the same but the spiracle of the propodeum is smaller and about its own diameter from the cephalic margin. The clypeus at apex is distinctly convexly projected. Valves of ovipositor distinctly shortly extruded. First ring-joint extremely short. Pedicel longer than the subquadrate funicle 1. Otherwise as in the named species.

Described from one female taken from a plum tree in New York State, May 25, 1888.

Type: Catalogue No. 20425, U. S. National Museum, the female on a tag and a slide.

Trydymus gargantua sp. nov.

Female: Length, 2.30 mm. Like *æneicornis* but very much larger, a third or more larger than *americensis* or *robiniæcola* and differing farther as follows: the scape is yellow at extreme base, the pedicel at apex and beneath, the funicle and club all so except above; the legs are golden yellow except the coxæ and the proximal two thirds (less on cephalic femur) of the femur which are metallic; the ovipositor is not at all extruded and the propodeal spiracle is large, oval and at cephalic margin. Pedicel subequal to funicle 1. The same otherwise.

The male is similar but the funicle is 6-jointed, the club 2-jointed, funicle 1 shorter.

Described from a pair from Ithaca, N. Y. (Cornell University).

Types: Catalogue No. 20426, U. S. National Museum, the pair on tags, male and female antenna and caudal legs on a slide.

The clypeal projection is somewhat more prominent in this species.

Trydymus poloni sp. nov.

Female: Like *gargantua* but the ovipositor is a little extruded, the legs are golden yellow except most of the middle and all of the caudal coxæ, the antennæ so except the scape above at distal two thirds, the pedicel above and the funicle joints too, more or less; the projection of the clypeus is not convex but subtruncate; the foveæ along the cephalic margin of the propodeum are minute and the spiracle is oval and a short distance off the cephalic margin. The same otherwise. Mandibles 4-dentate.

Described from one female on a tag in the U. S. National Museum from Franconia, N. H.

Type: Catalogue No. 20427, U. S. National Museum, the female on a tag, a caudal leg and the head on a slide.

A NEW SPECIES OF THE GENUS *MYMAR* FROM THE WOODS OF MARYLAND WITH AN IMPORTANT DESCRIPTIVE NOTE.

By A. A. Girault,
Bureau of Entomology, Washington, D. C.

Mymar cincinnati sp. nov.

Male: Similar to *venustum* (female type) but the antennæ are entirely black, the base of the blade of the fore wing is rather broadly infuscated, there are on the fore wing 43 primary marginal cilia (instead of 34), the midlongitudinal line of discal cilia runs from apex nearly to the base of the blade (instead of into the costal margin, farther from base); and most of the discal cilia of the fore wing are *caudad* of the midlongitudinal line instead of *cephalad* as in the other species. Scape long, curved; flagellar joints elongate, subequal, 2 eight times (or more) longer than wide.

One male captured by sweeping grass in an open wooded bog, Glenndale, Md., August.

Type: Catalogue No. 20468, U. S. National Museum, the specimen on a slide.

Mymar venustum has the caudal wing shaped like a long thick bristle with the hooklets at its apex. In the above new species it is similar but prolonged beyond the hooklets in the form of a hair as long as the part from base to the hooklets and after that length widening into a very linear blade of more than half the length of the hairlike pedicel and which bears a few long marginal cilia caudad. In *Mymar*, then, the hind wing has a short, very linear blade on a long pedicel while the petiole of the wing (from base to hooklets) is much longer than in the other genera. This blade part of the wing must break off easily and this accounts for its absence in *venustum*. In the Australian *M. tyndalli*, the blade-like portion of the caudal wing was absent. *Neomymar* has normal hind wings except that the petiole is long as in *Mymar*.

A METALLIC SPECIES OF *CIRROSPILOPSIS* FROM MARYLAND (HYMENOPTERA EULOPHIDÆ).

By A. A. Girault,
Bureau of Entomology, Washington, D. C.

The following species resembles a *Diaulinopsis* but there are no grooves on the scutellum, the caudal tibial spur is single and the club without a distinct apical nipple.

Cirrospilopsis metallicus sp. nov.

Female: Length, 1.10 mm. Brassy metallic green, the wings hyaline, the legs (except the coxæ; apex of first coxæ yellow), venation and the antennæ (except the scape and pedicel except both at apex), golden yellow. Body densely scaly, the parapsidal furrows distinct, the propodeum moderately short, noncarinate (a median carina subobsolete), the spiracles small, rounded, cephalad. Bristles on thorax minute, sparse. Postscutellum rather large. Mandibles 4-dentate, the last two teeth much smaller than the others. Pedicel subequal to funicle 1 which is nearly twice longer than wide, 2 somewhat shorter, the club somewhat longer than the funicle; ring-joints distinct. Middle tibial spur long, slender. Stigmal vein not quite half the length of the marginal, the postmarginal two-thirds the length of the marginal.

From two females captured by sweeping in the woods, Glenndale, Md., May 4, 1916.

Types: Catalogue No. 20291, U. S. National Museum, the specimens on a tag, a head and two caudal tibiæ on a slide.

A NEW SPECIES OF *CLOSTEROCERUS* FROM CALIFORNIA (HYMENOPTERA EULOPHIDÆ).

By A. A. Girault,
Bureau of Entomology, Washington, D. C.

This new species is characterized by bearing narrow fore wings with rather long apical fringes and a T on the fore wing formed by a long longitudinal stripe from proximad and the first cross-stripe; the letter is on its side, to the right from the upright.

Closterocerus tau sp. nov.

Female: Length, 0.85 mm. Black metallic blue, the scutum and scutellum lighter blue except marginally, the tarsi white except the distal joint; pronotum conical, light blue discally. Body densely scaly, the propodeum with a median carina only, subglabrous. Venation sooty, the very long marginal vein silvery white. Fore wing broadening distad, about thrice longer than wide at its truncate apex, its apical marginal cilia somewhat less than half the greatest width, the discal ciliation absent except on the infuscations; the thick longitudinal stripe originates at caudal margin opposite the base of the marginal vein and runs straight into the middle of the first cross-stripe which is across from the apex of the marginal and all of the post marginal veins (with the stigmal in its middle); first cross-stripe somewhat narrower than the second which is at apex, the hyaline space between them equal to the second cross-stripe. Stigmal and postmarginal veins subequal, not very short, the first at right angles to the marginal. Funicle joints equal, twice wider than long; pedicel very large, longer than the funicle. Mandibles tridentate. Otherwise usual. Wings with two cross-stripes.

From one female on a tag in the U. S. National Museum from Inyo County, California.

Type: Catalogue No. 20290 U. S. National Museum, the specimen above, the head and a fore wing on a slide.

could not be bred. The fact that none of the broods of *nais* and *phalerata* gave any specimens of the type of *vittata*, seems to show, that *vittata* represents a third, entirely distinct, species. In *vittata* both yellow and red specimens are found in both sexes. The black spots on the hind wings as well as on the fore wings tend to fuse together. Extremes of such forms seem to correspond with *A. radians* Walker. The costal border is always white which serves to separate the yellow specimens from *A. nais*, and the white collar band is always without black spots which serves to separate the red specimens from *A. phalerata*. The size is slightly above that of *A. nais*, on the average.

On the suggestion of Dr. Henry Skinner I compared the male genital claspers of several individuals of the three species spoken of. It was found that in fact *A. nais* and *A. phalerata* differ widely in the structure of these claspers, and it is not unlikely that copulation would be mechanically impossible. The genitalia of *A. vittata* are however very similar to those of *A. nais*, and it would be of interest to attempt hybridization of these two species.

The fact that Holland's abundant material came mostly from one and the same locality "one little ravine in western Pennsylvania," does certainly not imply that it was all of the same species. No less than eight different species of *Apantesis*, including the above spoken of, were found in the immediate neighborhood of the Bussey Institution, attracted to light, and fairly abundant. Most of these are certainly less variable than often supposed to be the case in this genus.

EXCHANGE COLUMN.

Notices not to exceed four lines in length concerning exchanges desired of specimens or entomological literature will be inserted free for subscribers, to be run as long as may be deemed advisable by the editors.

The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's Insects of New Jersey.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

Offered for cash, but exchange preferred. Fitch and early Illinois reports; Insect Life; Harris's Insect; many others.—J. E. Hallinen, Cooperton, Okla.

Histeridæ. North American Histeridæ identified or unidentified, desired in exchange for beetles of other families. F. G. Carnochan, Bussey Institution, Forest Hills, Massachusetts.

Hemiptera-Heteroptera. I desire specimens of this group from all regions, especially New England. I will give in exchange species of this and other orders (except Lepidoptera), and will identify New England material. Correspondence desired.—H. M. Parshley, Bussey Institution, Forest Hills, Mass.

Wanted: Psyche, Vol. IX, No. 300 (April, 1901). Address, giving price, Librarian, Stanford University, Cal.

Sarcophagidæ from all parts of the world bought or exchanged according to arrangement. North American material determined.—R. R. Parker, Entomological Laboratory, Massachusetts Agricultural College, Amherst, Mass.

Wanted: Transactions American Entomological Soc., Vol. 4; Entomological News, Vol. 2, Nos. 6 and 10; Vol. 8, Nos. 1 and 6; Vol. 9, Nos. 1 and 2; Vol 10, No. 10; Vol. 11, Nos. 1, 3 and 5. Will purchase at reasonable price.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

Wanted: Insects of any order from ant nests, with specimens of the host ants, from any part of the world; also Cremastochilinæ of the world. Will give cash or Coleoptera, Hymenoptera and Diptera from the United States.—Wm. M. Mann, Bussey Institution, Forest Hills, Boston, Mass.

Want to correspond with collectors of Noctindae in Northern Massachusetts. Subject to supply will pay any reasonable price for good specimens Catocola Sappho.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

Wanted: Old Series Entom., Bul. 1, 2, 3, 33; Technical Series 4, 6, 7; Insect Life, vol. 4–6; Jour. Applied Microscopy I, N. Y. State Entom. Rep. 3, 4; Fitch Rep. 7, 8, 13.—Philip Dowell, Port Richmond, N. Y.

Would appreciate receiving date, stage and mode of hibernation of insects of all orders. J. P. Baumberger, Bussey Institution, Forest Hills, Boston, Mass.

Wanted: Ill. Ent. Rpts. 2, 3, 5, 7. 9, 10, 11, 12, 13, 19; Hensham's List of the Coleoptera of America North of Mexico, 1895. For Exchange Bulletins and Circulars U. S. Bur. Ent.—J. S. Wade, Wellington, Kan.

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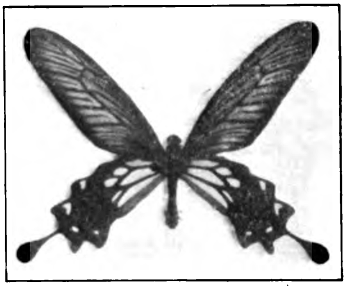

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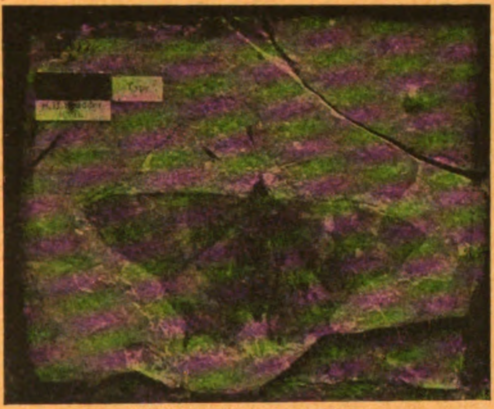

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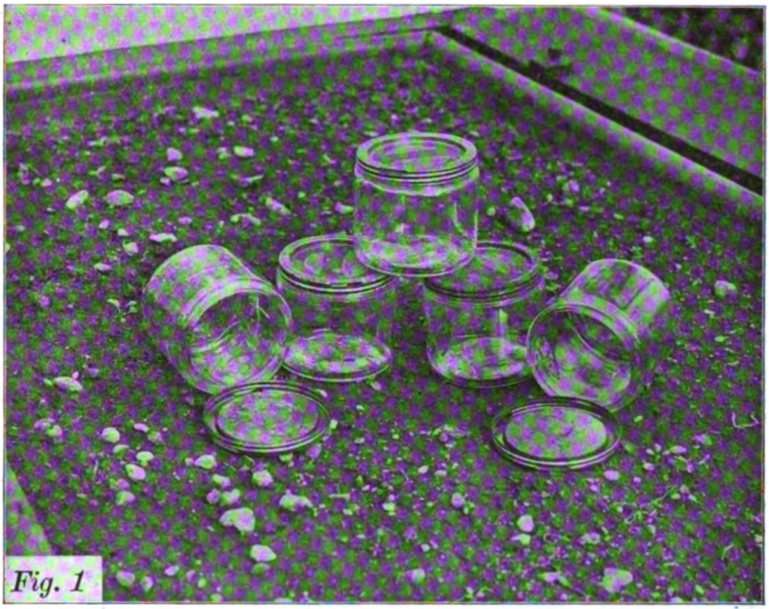

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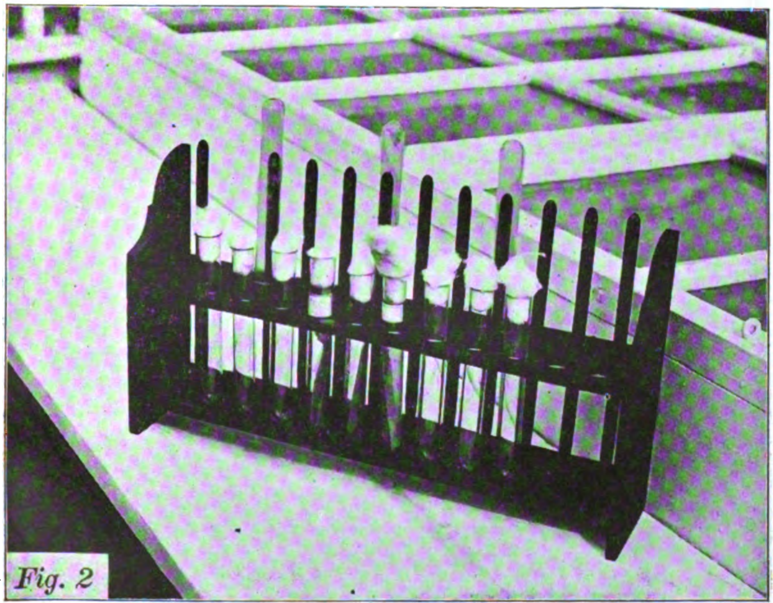

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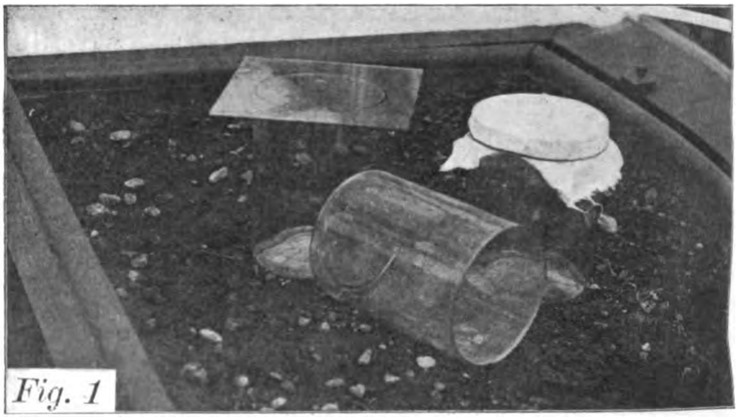

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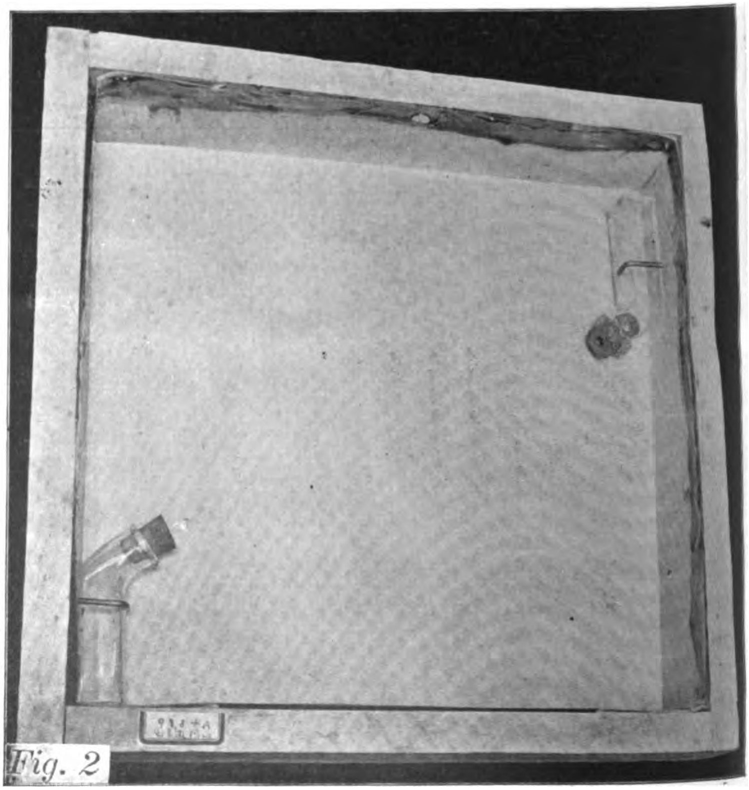

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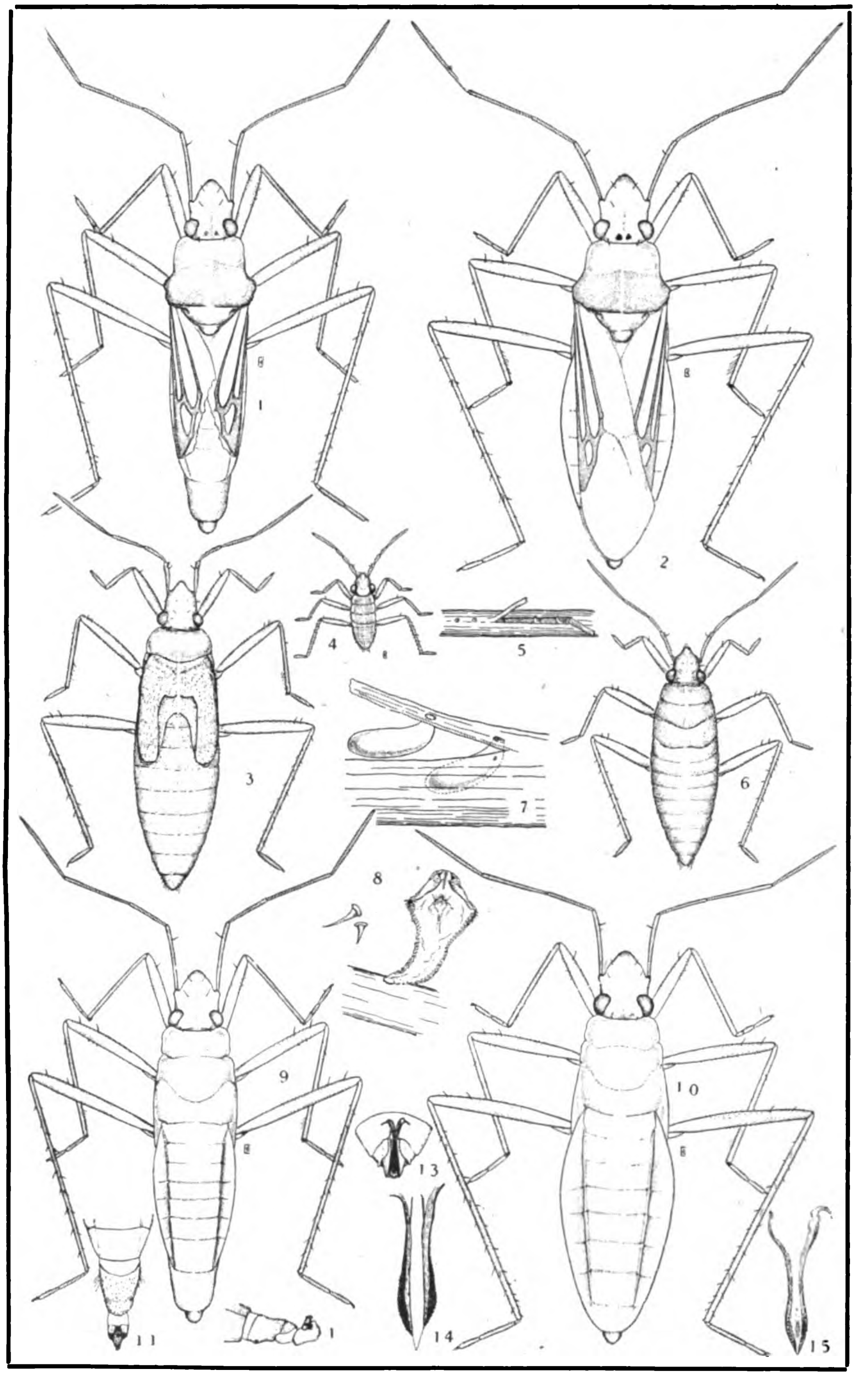

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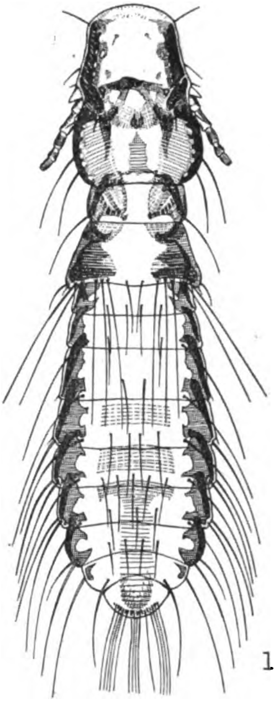

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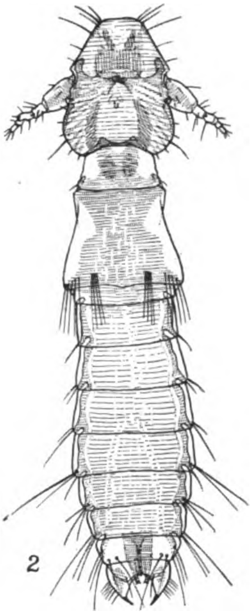

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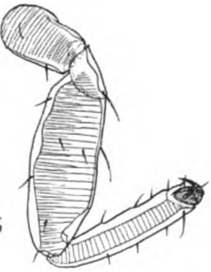

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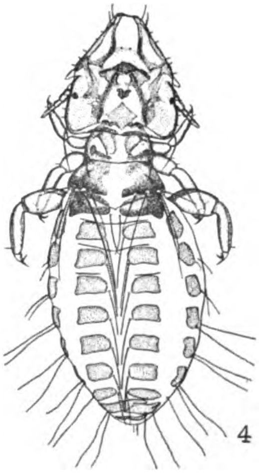

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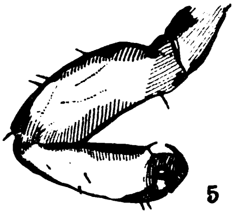

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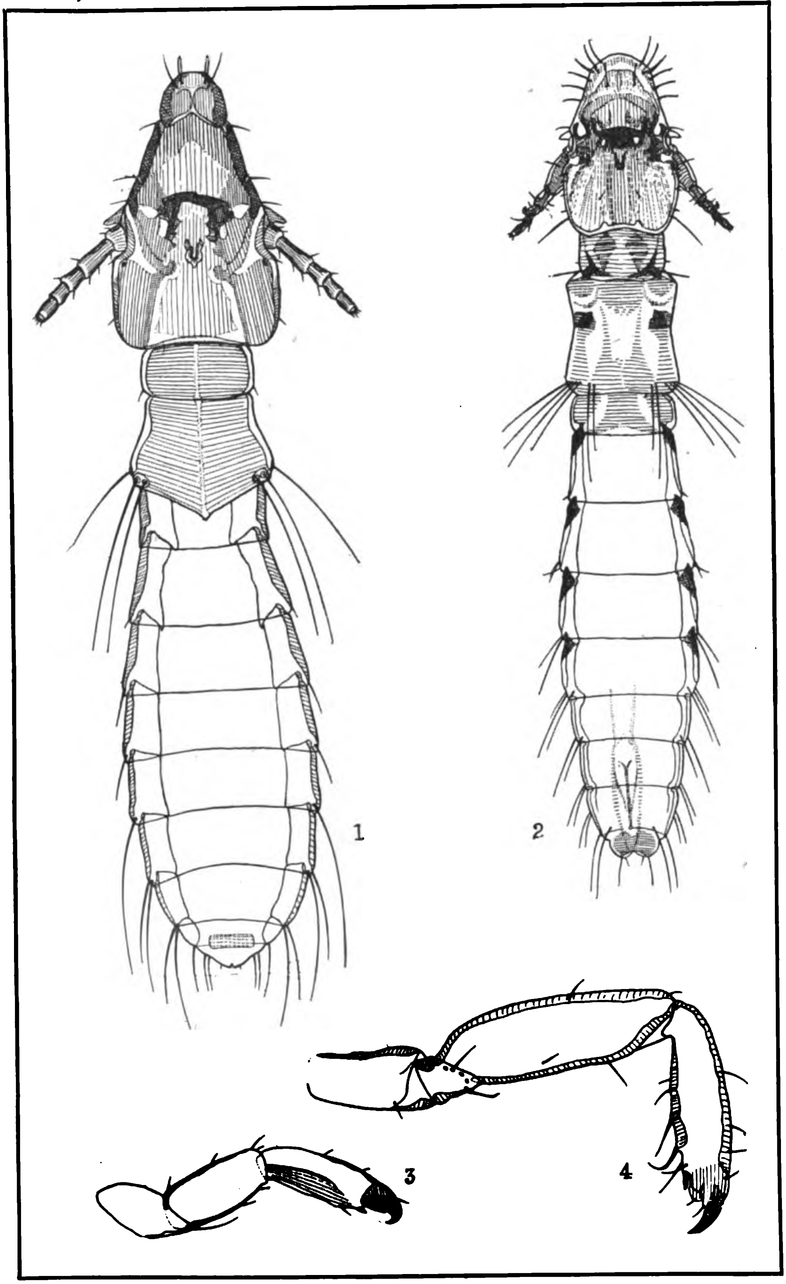

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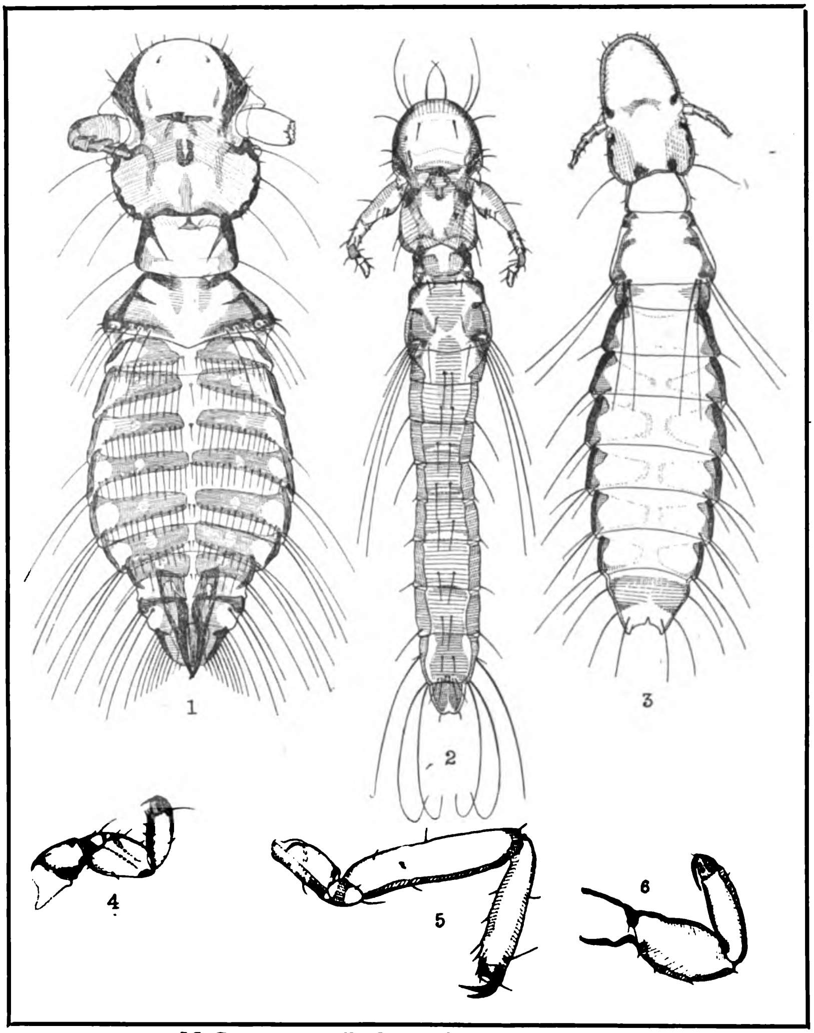

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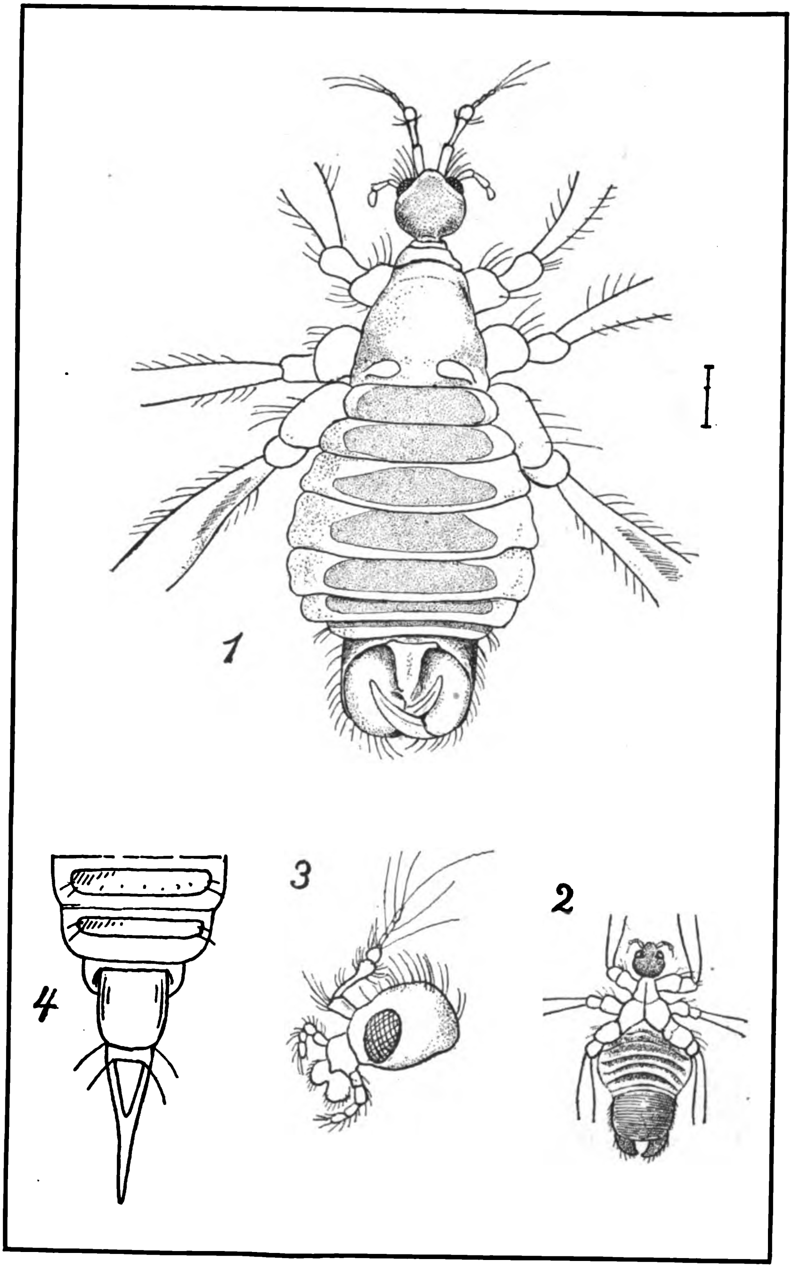

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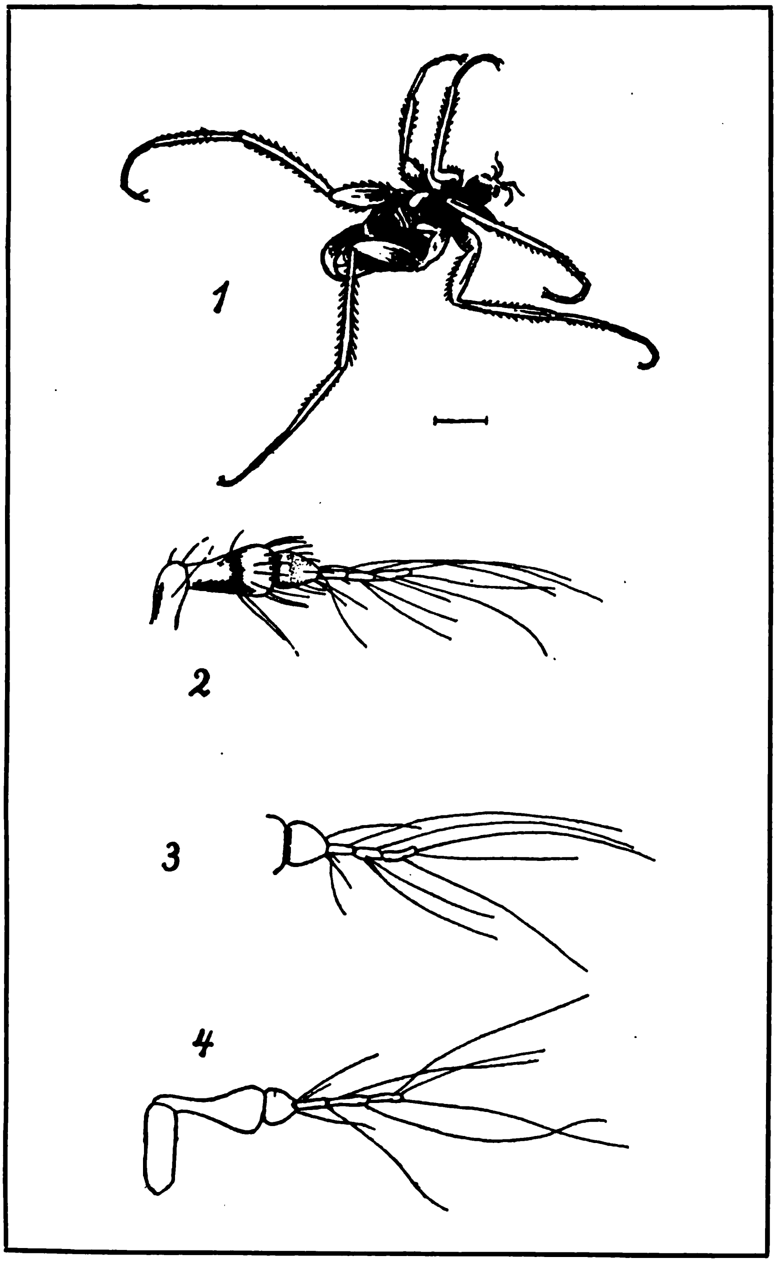

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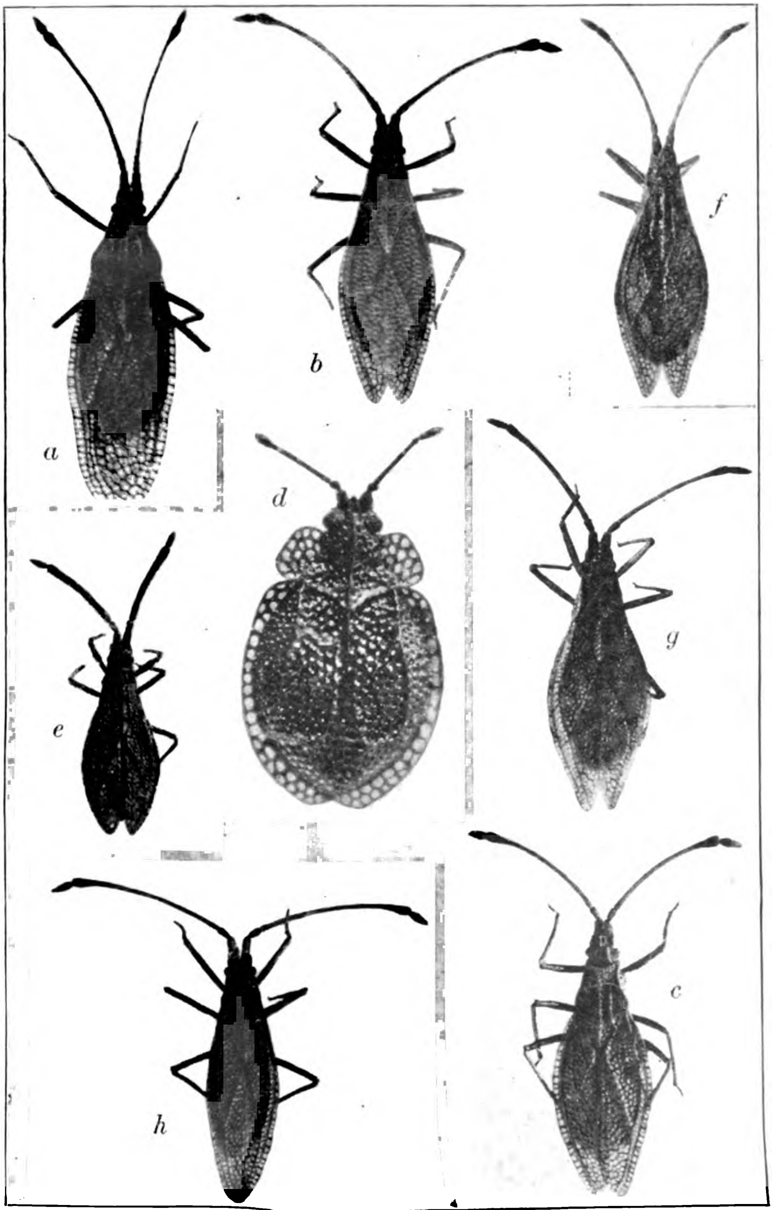

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